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THE IRON TRADE REVIEW

VOLUME XXXI. CLEVELAND, O. AUGUST 4, 1898. CHICAGO, ILL. NUMBER 31

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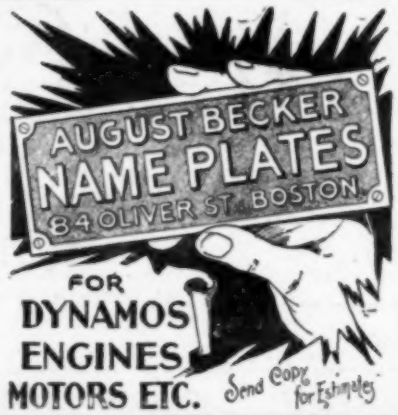

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On Page 24.

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THE IRON TRADE REVIEW

VOLUME XXXI. CLEVELAND, O. AUGUST 4, 1898. CHICAGO, ILL. NUMBER 31

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

To the reality of an unparalleled mid-summer business in iron and steel the assurance of speedy peace with Spain has added in the week the prospect of a campaign of fall buying that is regarded with satisfaction by the entire iron trade. Foreign business in iron has loomed up of late in even larger proportions than before the war made rates prohibitive; and home consumption will include not only liberal Government requisitions for the new scale of land and sea armament that is to be maintained, but cheap money and continued railroad and agricultural prosperity are determining in advance the characteristics of a twelve-month likely to be exempt from war or the threat of it. The furnace interest of the country—particularly the Bessemer part of it—is under a regime that should prove healthful preparation for a period of expanding demand—lessening output and diminishing stocks. Piled iron at Shenango and Mahoning valley furnaces still reaches a considerable total, but it is demonstrated by recent quotations that it is $10 iron, and that the furnacemen's position is stronger than at any time in the past two months. Southern irons are showing more firmness, with higher quotaions by some makers, for soft grades. Light sales are reported for the week, but in the past few days inquiry for round lots has appeared The Lake Superior ore trade evinces lively interest in the Illinois Steel-Minnesota Iron proposition, and negotiations in other directions would indicate further concentration in the ore business by another season. The practical conclusion of deals that give the Carnegie-Oliver interest two Vermilion mines is announced. The figures for Bessemer iron production in the first half of the year seem to justify the liberal estimates for Lake Superior ore output this season and suggest that exploration on old ranges, in search of Bessemer reserves, cannot be premature. In steel, recent developments indicate an oversold condition of some Central Western billet and sheet bar plants, giving a somewhat firmer feeling to the market. Rods are less of a market factor since two Ohio buyers entered the wire consolidation. A new feature of interest noted elsewhere is the plan for another Ohio rod mill, that will bridge the gap between billet mill and the nearest wire mill and save cross-shipments. Chicago reports an 8,000-ton sale of bars, and on all hands the continued heavy buying of agricultural works is strengthening calculations for heavy fall trade. Following last week's large contracts for steel for foreign shipment from Pittsburg, is a sale of 2,000 tons of export billets and rods. Plate and structural works continue to book orders practically equal to current shipments, and Pittsburg, in particular, notes some early effects of peace arrangements. There is a growing feeling that some slight advances may come as the result of the buying movement believed to be just ahead. Even the weaker lines are more confident. Wire nail and tin plate mills seem to be feeling in a special way the effect of conspicuously large producing capacity.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
808 TRADESMEN'S BUILDING, Aug. 3.

Already August seems to have worked some change in market conditions, as some of the lines show a decidedly firmer feeling, and in these the outlook is for better prices generally within the next 30 days. The good prospect of peace has begotten confidence and projects that were postponed on account of the war are expected now to be brought forward and pushed to completion.

PIG IRON.—This week finds the price of Bessemer iron on about the same basis as last but the outlook is such for a realization of the furnacemen's price that sales have been few in number. The present quotation is from $9.80 to $9.90 valley, and $10.45 to $10.55 Pittsburg. It is estimated that by adhering to their plan of shutting down the furnacemen curtailed the production of pig iron about 35,000 tons last month, and what with repairs and the shut-downs for the good of the market, that are scheduled for August, there will be greater restriction this month. Gray forge shows some slight movement in small lots, the quotation being from $9 to $9.15. Foundry irons are quiet and firm, the quotation for No. 2 being $10 to $10.15. We quote as follows:

Bessemer, valley	$ 9.80 to	$ 9.90
Bessemer, Pittsburg	10.45 to	10.55
No. 1 Foundry	10.40 to	10.50
No. 2 Foundry	10.00 to	10.15
No. 3 Foundry	9.50 to	9.75
Gray Forge, valley furnace	8.70 to	8.75
Gray Forge, Pittsburg	9.00 to	9.15

BILLETS AND RODS.—The billet market is stronger than last week's and it appears that the mills are oversold to a considerable extent. As yet the leading wire interest is reported to have bought no billets in this district. The export business continues good, an order of 2,000 tons of billets and rods being among the business of the past week. Billets are quoted at $14.75 to $15 maker's mill, Pittsburg, and $14.50 valley and Wheeling district, with some business at the maximum figure. Sheet bars and rods are firmer than for some time past. The sheet and tin plate bar mills are full and prompt deliveriy cannot be had. Bars are quoted at $16.75 to $17. Rods are on a basis of $20 to $20.50.

PLATES.—Orders have been coming in in fair quantities. The mills are all busy, although some are not booked far ahead. Locomotive orders continue good, a local firm booking plates for 15 during the past four days and the number is increasing daily. Prices continue unchanged and are as follows: Tank, 1.10c; shell, 1.15c; flange, 1.20c; fire-box, 2c and upwards.

STRUCTURAL MATERIAL.—This branch of the trade is maintaining its recent record. The Government contract for the buildings at Ellis Island is still unplaced. Alternative bids were made, one for the general contract and one for the steel work. Bids were opened Tuesday and it is understood the two lowest were unsatisfactory. The job calls for about 5,000 tons. Small orders continue to come in and the resultant tonnage is very gratifying. Quotations: Beams and channels, 3 to 15 inches, 1.15c; 18 to 24 inches, 1.25c; tees, 1.20c; zees, 1.15c, and angles, 1.05c. Universal plates in connection with other shapes are selling at 1c; alone, at 1.10c.

IRON AND STEEL SKELP.—The demand for the wider sizes, particularly steel, continues good, and the market is firm at last week's prices. Grooved iron skelp, 1.05c to 1.07½c;

sheared iron skelp, 1.10c to 1.12½c; grooved steel skelp, 0.95c to 0.97½c; sheared steel skelp, 1.10c to 1.12½c.

SPIEGEL.—The quotation is $23.50 to $24, with little inquiry.

SHEETS.—Reports from the sheet mills indicate a general betterment of their condition. Some are booked full for the next 60 days, which is about as far as they care to go, as a continuance of the demand, it is thought, will result in an advance in prices. No. 28 sheets are quoted at 1.92½c to 1.95c. Galvanized sheets are steady at 80 and 7½ to 80 and 10 per cent off list with 18 cents freight.

PIPES AND TUBES.—Last week brought an advance in price of 1c per foot in the smaller sizes of steam, gas and water pipe. The present basis is ⅛ inch black .06½c; galvanized, .09c; ¼ inch black, .06½c; galvanized, .08½c; ⅜ inch black, .06½c; galvanized, .08½c. The general condition of this line of material is good, the mills being crowded. A shipment of 2,000 boiler tubes for the United States vessel Vesuvius has been made by one local firm and a contract for 40 miles of 8-inch pipe for the Standard Oil Co. has been awarded to another. The same discounts of six tens for less than carload and six tens and two and a half for carload lots are quoted. Base discounts are as follows: Butt weld, black, 57 per cent off; lap weld, black, 67 per cent off; butt weld, galvanized, 50 per cent off; lap weld, galvanized, 55 per cent off. Discounts on merchant boiler tubes are as follows: 2¼ inch and smaller, 72½ per cent off; 2½ inch and larger, 75 per cent off. Inserted joint casing is quoted at 60 and 5 per cent and screw and socket joint at 65 and 5 per cent.

OLD MATERIAL.—There is little demand for old material, although one sale of 1,000 tons steel rails mixed lengths at $10.25 cash is reported. Other quotations are: Heavy mixed steel scrap, $10.25, gross; old iron rails, $13.50 to $13.75, valley; cast borings $5.75, net, valley; wrought turnings, $7.25 net, valley; railroad cast scrap, $9.50; wrought scrap, $11.50, valley; iron axles, $16, net; steel axles, $12.50, gross; car wheels $10.50, gross; charcoal scrap, $10, gross; billet and bloom ends, run of mill, $11; busheling scrap, $9.50 net; machine scrap, $9 gross.

RAILS AND TRACK MATERIAL.—Railroad material is still in good demand. Prices are as follows: Rails, $18, Pittsburg; iron track bolts, 1.65c to 1.70c; splice bars, 1.10c to 1.15c; links and pins, 1.20c. Spikes, 1.40c to 1.45c.

FERRO-MANGANESE.—The quotation on ferro-manganese is still $50 for 80 per cent domestic delivered, with a steady demand.

SPELTER.—Spelter has held fairly steady the past week, the present quotation being $4.50 to $4.55.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World.*
1522 MONADNOCK BLOCK, Aug. 1.

The finished material market continues very active, and a considerable tonnage in various lines was closed last week, with further orders expected to be placed within the next few weeks. In raw material the market has been quiet, although sufficient tonnage has been placed to keep the order books filled as far ahead as they have been for the past several weeks. Consumers are taking their material as fast as the mills and furnaces can deliver it, and in many cases are asking shipments to be hurried. Buyers who placed orders recently for their season's requirements, are figuring in some instances on further contracts. There is a steady demand and sale of all material going to car works, agricultural implement manufacturers, plow makers, wagon makers, etc., and in all likelihood these buyers will require much more material this year than ever before.

PIG IRON.—In view of the fact that this is the quiet season of the year, when very little selling is usually done, the sales of local iron are remarkably good. The local furnaces are selling the equivalent of their output, week by week, so that there is no gaining on order books. The foundries continue to run very full, and many are asking for shipments in advance of their contracts. The Southern iron makers are not selling much apart from small lots. Some of the Southern furnaces are asking more for their iron, particularly soft grades, than we quote, but the general market does not appear to have advanced. The feeling is a little firmer, and predictions are heard of of advances by all the furnaces within a short time. We quote:

Lake Sup. Charcoal	$11 50	@$13 00	Southern Coke No. 3	$ 9 75	@$10 00
Local Coke Fdy. No. 1	11 50	@ 12 00	Southern No. 1 Soft	10 35	@ 10 60
Local Coke Fdy. No. 2	11 00	@ 11 50	Southern No. 2 Soft	10 10	@ 10 35
Local Coke Fdy. No. 3	10 75	@ 11 00	Southern Silveries	11 25	@ 11 50
Local Scotch Fdy. No. 1	11 50	@ 12 00	Jackson Co. Silveries	12 50	@ 14 50
Local Scotch Fdy. No. 2	11 00	@ 11 50	Ohio Strong Softeners	12 00	@ 12 25
Local Scotch Fdy. No. 3	10 75	@ 11 00	Alabama Car Wheel	15 00	@ 16 00
Southern Coke No. 1	10 35	@ 10 60	Malleable Bessemer	11 50	@ 12 00
Southern Coke No. 2	10 10	@ 10 35	Coke Bessemer	11 50	@ 12 00

BARS.—Sales of about 8,000 tons of bar steel were made last week by the largest local interest. Other mills sold a good tonnage, and the total for the week was fully as large as in the preceding week, probably larger. The demand from all classes of consumers is excellent, and bids fair to keep up. Many of the mills prophesy the best six months in the history of the trade, so far as tonnage is concerned, for the period ending Dec. 31. It seems to be the general opinion, too, that prices will be on a higher basis before the end of the year. Quotations are unchanged at 1.05c to 1.10c for common iron; 1.15c to 1.20c for guaranteed iron; 1.10c to 1.15c for soft steel bars from strictly billet stock.

RAILS AND TRACK SUPPLIES.—The local mills made sales of about 4,000 tons of rails last week, and report a good demand. Further orders are expected to be placed immediately. Quotations are as follows: Rails, $20 to $22.50, according to specifications; steel splice bars, 1.15c to 1.25c; track bolts, with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.50c to 1.60c.

BILLETS AND RODS.—Some sales were made in this market last week, by mills farther east, but they were not large, and the local mills sold only a small tonnage. Prices are unchanged at $15.75 for billets and $20.75 for rods.

CAR ORDERS.—Some contracts for good lots are expected to be closed soon. Car material continues in good demand, and excellent sales are made every week.

STRUCTURAL MATERIAL.—The Geo. A. Fuller Co., of this city, took a contract for a 1,500-ton building in Baltimore, Md., last week, the steel to be rolled in Pittsburg. The Keystone Bridge Works, took an order for about 300 tons of work from the Southern Indiana Road. No other noteworthy contracts were placed. The eight-track bridge over the Drainage Canal is being considered this week, and it is thought the contract will be let finally before the end of the week. The Drainage Canal Commissioners also will open bids on the five smaller bridges this week. Altogether, this work will amount to nearly 6,000 tons. The Yondorf building, taking 300 tons, will be let soon, and also the McCormick building, taking about 1,500 tons. General business has been good, and sales of small lots are encouragingly frequent. The market is very firm, but prices are unchanged. Quotations are as follows: Beams, 15-inch and under, 1.30c to 1.35c; 18, 20 and 24-inch, 1.40c to 1.45c; angles, 1.20c to 1.25c; plates, 1.15c to 1.25c; tees, 1.35c to 1.40c. Small lots from stock are quoted at ¼ to ½ cent higher.

PLATES.—There is a very good demand for plates of all kinds, and outside mills are securing a good tonnage every week. The local mills are so full of work they find it almost impossible to bid on orders for near-by delivery. The tonnage placed last week was in excess of that of the week previous. Prices are made as follows: Tank steel, 1.15c to 1.25c; flange steel, 1.20c to 1.40c; fire box steel, 1.85c to 5c.

SHEETS.—The market has been quiet, but a few good orders have been closed, making a fairly good tonnage for the week. Black sheets are now quoted at 2c to 2.05c, and galvanized at 80 and 10 per cent off, with freight allowance.

SCRAP.—There is somewhat of a shortage in cast scrap, and the price is consequently firm. Other grades are in light demand, and the market is inclined to weakness. Very few sales have been made, and none were large. Dealers' selling prices are as follows:

Old iron rails, gross	$12 25	@$12 50	Axles, net	$14 25	@14 75
Old steel rails, long, gr.	10 50	@ 11 00	Cast borings, net	4 25	@ 4 50
Old steel rails, short	8 75	@ 9 00	Wrought turnings, net	6 00	@ 6 50
Old wheels, gross	11 00	@ 11 50	Axle turnings, net	7 00	@ 7 25
Railroad forge, net	11 50	@ 12 00	Mixed steel, gross	7 25	@ 7 50
Dealer's forge, net	10 00	@ 10 50	Stove plates, net	5 75	@ 6 00
No. 1 mill, net	7 50	@ 8 00	Heavy melting steel, gr.	8 25	@ 8 50
Heavy cast, net	8 50	@ 9 00	Old iron splice b., net	12 75	@ 13 00
Malleable cast, net	8 00	@ 8 50			

MERCHANT STEEL.—Considerable business has been done in the week, including several good contracts from carrriage and wagon makers. Orders for shipments on contracts are unusually large and early this year. The small lot business is excellent, and sales from store are fully up to the expectations of the dealers. Prices follow: Open-hearth spring, tire and

machinery steel, 1.60c to 1.70c; smooth-finished machinery steel, 1.55c to 1.65c; smooth finished tire, 1.45c to 1.55c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World*, 27 VINCENT ST., Aug. 3.

The acquisition of the Zenith mine by the Oliver Iron Mining Co., and the substantial arrangement of terms for the Pioneer mean an unexpected addition to the output of the Vermilion range in 1898. The move points to a continued large use of old range ores by the leading Pittsburg interest and indicates that high-grade Bessemers from these ranges must be used in liberal quantities with certain grades of Mesabi material. It does not signify any increase in the conservative percentage of the Mesabi steam shovel product that has been approved by latest Pittsburg practice. There is no present sale for ore, though some Mesabi deals are pending. Two or three cases are reported in which Mesabi ores have developed greater irregularity this season than before, and shipments have not been on the expected scale. In the case of two Mesabi mines negotiations are pending for a change in ownership.

PIG IRON. — Hannah, Lowellville, Struthers, Tod and Thomas furnaces in the Mahoning valley have banked or blown out in the past week, so that only three stacks are going in the Youngstown district. In spite of the curtailment there are still goodly stocks of Bessemer iron on hand. But the enormous consumption of Bessemer and the promised expansion of business in the fall months are confidently counted on to establish the $10 price at an early day. Meantime it is well held, in spite of some recent efforts to break the furnacemen's line. The market is swinging toward the seller and purchases for late months of the year are looked for at almost any time. Foundry irons are called for smartly on contracts, and the consumption promises to be larger in the fall. Lake Superior charcoal is steady at unchanged prices, with inquiry moderate. Stocks have been greatly reduced in the past six months—something over 45,000 tons. We quote f. o. b. Cleveland:

Bessemer,	$10 65	Valley Scotch No. 1	$10 40@10 65
No. 1 Strong Foundry	10 40@10 65	Valley Scotch No. 2	10 25
No. 2 Strong Foundry	10 10@10 25	Gray Forge	9 25
No. 3 Foundry	9 65	Lake Superior Charcoal	11 50

FINISHED MATERIAL.—There is no pronounced demand in any single line, but for mid-summer the volume is very satisfactory. Plate mills continue to take orders equal to current shipments and prices are more nearly uniform. Cleveland deliveries of tank are quoted 1.12½c to 1.15c. Lighter plates are active at corresponding prices. In structural shapes the business is in small lots. The Lorain contract for bins, furnace and blooming mill buildings, trestles, etc., let a short time ago, aggregated 2,000 tons. The steel will be rolled and fitted in Pittsburg. Bar requirements, in both iron and steel, are heavy, and mills are busy. The heretofore weaker sellers of bar iron are a bit firmer. We continue the quotation of 1c Cleveland, on iron and steel. Sheets continue fairly active. We quote No. 28 at 2c to 2.05c, Cleveland. Two local wire nail mills are involved in a strike of wire drawers, and the effort is to be made by union employes to extend the contest to other plants of the combination. The wire nail trade is only moderately active; for prompt shipment mills have named $1.25 in carload lots, though $1.30 is the general quotation for forward deliveries. Smooth wire is still $1.15 and four-point galvanized, $1.65.

CINCINNATI.

Aug. 2.

Through most of the past week there has been a quiet pig iron market, with a fair run of carload orders, but no large business. In the past few days several inquiries for round lots have been made and some of them are expected to materialize into orders. An advance is announced by one Southern producer, soft grades particularly being held more firmly. There are some indications of a hardening tendency, though consumers apparently have no expectation of a change in that direction. We quote f. o. b. Cincinnati: Southern coke, No. 1 foundry, $9.50; No. 2, $9.25; No. 3, $8.85; No. 4 and gray forge, $8.50; mottled $8.25 to $8.50; No. 1 soft, $9.50; No. 2, $9 15; Tennessee charcoal, No. 1, $12.50 to $13; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Jackson county silvery, No. 1, $12 to $12.50; standard Georgia car wheel $14.25 to $15.

PHILADELPHIA.

Aug. 1.

July was a month of few developments in the local iron market. There is the same weakness in prices that has disturbed producers for several months past. The elusive element of stocks of iron in the hands of consumers and at furnaces of steel works negatives calculations based on a considerable excess of consumption. At all events the enormous use of iron and steel at present does not tell on prices; and the eagerness with which some producers are pushing for business gives anything but a promise of the firmer market which it is admitted may materialize soon, under the indications for fall business. An occasional seller is a shade firmer because of the steadiness of demand through the summer and the increasing expectation of peace, but quotations are unchanged at $11.25 to $11.50 for No. 1X foundry; $10.50 to $10.75 for No. 2X foundry; $10 to $10.25 for No. 2 plain; $9.75 to $10 for mill iron; $12 to $12.25 for Bessemer. Billets are dull. Business could doubtless be done on a basis of $16.50. The reports of activity in finished material in the Pittsburg district and the steadiness of the export movement, with the well occupied mills in so many lines, add to the confidence generally expressed that the last half of the year is to be one of unprecedented demand upon iron and steel works. Plate and structural works are crowded and are steadily booking orders, but at old prices. We quote beams and channels at 1.30c; angles, 1.20c; refined bar iron, 1.05c to 1.10c; steel bars, 1.10c; plates, 1.20c.

Riveted Steel for Pipe Work.

At the Detroit meeting of the American Society of Civil Engineers, last week, President Alphonse Fteley in his annual address reviewed the work of the past year in different branches of the engineering profession. Concerning steel pipe construction he said:

"Construction has been favored by the decreasing price of iron and steel. The price of cast iron pipes, especially, has never been so low as it is at present. Steel riveted pipes, for the conveyance of water from the source of supply to the point of consumption, in recent years, have been introduced more liberally in the east. For long distances, with large diameters, under heavy water pressure, especially when few connections have to be used on the way, these pipes are as much superior to cast iron pipes as the steel substitute is to the old cast iron tension member of a bridge, and it is not doubted that they will be ultimately used to the exclusion of others, but, unfortunately, although similar pipes made of wrought iron have been successfully used for years on the Pacific Coast and elsewhere, it cannot be said that the coatings used to preserve the metal from oxidation are entirely satisfactory. The rivets used for fastening the pipes and the tapping joints impede the flow to a certain extent, and a pipe has been devised the fastenings of which are entirely outside and provide the pipe with a smooth bore. The great improvement in steel welded pipes of large diameter will also remedy that defect to a large extent. An order is reported of several thousand tons of welded pipes to be made of Siemens-Martin mild steel, 24 feet long and 42 inches in diameter, for the Birmingham Water Works. The possibilities of steel pipes are well illustrated by the proposition to convey a much-needed supply of water, of 5,000,000 gallons per day, to a mining district of Western Australia, by means of a pipe 30 inches in diameter and 328 miles long."

WORK on the reorganization of the Weston Engine Co., Painted Post, N. Y., is progressing. Capital is available, provided the interest of the A. Weston estate can be purchased at a figure. With the addition to the machine shop, completed before the assignment was made, the capacity of the plant was nearly doubled.

THE Elba Iron Works, of the Oil Well Supply Co., Pittsburg, which has been long inactive, resumed work this week.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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THE STORY OF THE PIG IRON FIGURES.

The enormous production of Bessemer pig iron in the first half of 1898 is a striking feature of the statistics of the American Iron and Steel Association which we printed last week. In view of the sharp falling off, not only in aggregate but in percentage of Bessemer production in 1896, as compared with 1895, and the accompanying increase in basic iron, which was reflected also in the enlarged output of basic steel, there were some predictions then of a decline of the Bessemer percentage. This seemed borne out, too, by the increasing specifications of open-hearth material in structural work. So far as the pig iron figures can gauge the drift—and in the main Bessemer pig iron indicates the course of Bessemer steel—the increased manufacture of open-hearth steel is not at the expense of the Bessemer product, but has been accompanied, in the past year, at least, by a notable expansion in the latter. The following table is interesting, showing the total production of pig iron in the United States, in long tons, in the years and half years named, and the percentage of Besssemer:

Year.	Production of Pig Iron.	Production of Bessemer Iron.	Per cent Bessemer.
1891	8,279,870	3,472,190	41.9
1892	9,157,000	4,444,041	48.5
1893	7,124,502	3,568,598	50.9
1894	6,657,388	3,808,367	57.2
1895	9,446,308	5,623,695	59.5
1896	8,623,127	4,654,955	54
1897 1st half	4,403,476	2,495,978	56.7
1897 2d half	5,249,204	3,299,606	62.9
1898 1st half	5,909,703	3,781,314	64

Making comparisons with the first half of 1897, it appears that the Bessemer production increased 1,285,336 tons, or over 51 per cent, while foundry and forge increased but 135,997 tons or 9 per cent. Comparing witn the second half of 1897, the increase in Bessemer pig was 481,708 tons, or 15 per cent, while in foundry and forge it was 100,000 tons, or 6.7 per cent. With the apparent expansion in foundry operations, of which there has been pretty general testimony in the past six months, the comparatively small increase in consumption of foundry iron is surprising. Forge iron, judging from market developments from week to week, has gone much more largely into consumption in the first half of the year than in either half of 1898. Agricultural, car works and railroad contracts for bar iron have been heavy beyond precedent in recent years. It would seem that the increased prosperity in the foundry trade has been largely in lines—particularly malleable—which use charcoal or Bessemer coke iron. Agricultural malleables, car wheels and ammunition work are known to have been produced in considerably increased quantities in the first six months of the year, as compared with any like period of 1897. Charcoal iron production, for example, increased 23,000 tons over the first half of 1897, and the reduction of stocks between Dec. 31 and June 30 was 51,298 tons, of which 45,000 tons was in Lake Superior charcoal. There is no question, too, that considerable Bessemer coke iron was absorbed in malleable work.

The significant fact in the figures is the tremendous demand upon the furnaces which make the bulk of the steel-making pig iron of the country—a demand that with the increasing shipment of our steel products abroad promises to be even greater in the second half of the year. It would seem that while Central Western furnaces have been compelled, under concerted arrangement, to cut off more than 100,000 tons that under continued operation would have been added to surplus stocks, they will not have the same experience to repeat in the second half of 1898.

And if it be true, as the pig iron figures have been interpreted to show, that the foundry trade, apart from consumers of Bessemer and charcoal irons, has not yet come into its share of prosperity, there is further encouragement for the merchant furnaces of the Central West in the fact that they must be depended upon to meet any considerable demand arising from the expansion of the general foundry trade whenever it comes.

There is a deduction from the Bessemer pig iron figures of special interest to producers of Lake Superior iron ores. While only approximate estimates can be made, it can be readily figured that a Bessemer pig iron production of 7,560,000 tons a year, which is the rate of the first half of 1898, means the consumption of nearly 11,500,000 tons of Lake Superior Bessemer ores, from 7,000,000 to 7,500,000, tons of which must come from the old ranges. It is not too soon to be looking up new mines, if the well known properties are to be steadily exhausted at this prodigious rate. The presumption is that the reserves are ample. But will they be developed in time?

THE suspension of work on the Erie canal improvement left the canal in a condition that has seriously impaired its efficiency this season. Up to July 16, owing to breaks which delayed the boats, and to late opening, the total of grain through the canal was 5,453,000 bushels, against 7,238,000 bushels to the same date last year, and it will be remembered that the 1897 shipment was unusually low. The *Engineering News*, commenting on this showing, says:

On the other hand, the total grain receipts at New York since May 1 have been more than 7,000,000 bushels larger than last year; and the elevator pool at Buffalo, which has for so many years been denounced as the chief enemy of the canals, has been broken. Instead of the old standard rate of ⅞-cent per bushel for elevating grain at Buffalo, the rate this year has dropped as low as ⅛-cent. The railways, however, also have the benefit of the lower elevator charge, and it is said that they are now transferring grain from lake steamers to cars at Buffalo in some cases without charge. Another notable fact is that nearly all the canal grain traffic has been in corn and oats. Only 16,000 bushels of wheat have been shipped by canal up to date this season, while the railways have brought to New York nearly 17,000,000 bushels. Apparently, in the rapid fluctuations of the market the slightly cheaper rate on the canal has cut no figure in comparison with the greater dispatch of the railway. The grain shipper had rather pay two or three cents more a bushel than run the risk of a drop in price of three or four times that amount. In view of the fact that since the canals opened the railways have carried seven-eighths of the grain traffic, and that the total amount of grain coming to New York has increased at the same time that the canal traffic has fallen off, those who urge the maintenance of the canals as essential to New York's supremacy in the export trade may find it necessary to revise their opinions.

Hampered as it has been by the narrow policy of the State, and handicapped by the high elevator charges at Buffalo, the Erie Canal has yet been a factor in the freight market, and has exerted an influence on freight rates that has benefited the shipper. The true policy in reference to waterways is the liberal one. In the case of the Erie Cnaanal, the possibilities of through tonnage, without breaking cargoes, from lake ports to the seaboard, call for thorough investigation and experiment, before the policy of gradual abandonment which is covertly urged in some quarters, is entertained. The Erie Canal, with needed lighterage reforms at New York, is yet to have an important part in the development of the export trade; and the only policy that will conserve the interest of Western shippers and of New York State as well, is the progressive policy. The present condition of the improvement campaign is in all respects unfortunate.

THE statement of the foreign trade of the United States in the fiscal year ending June 30, 1898, is a remarkable one. There has been much curiosity to know the final figures relating to exports of manufactured products. The increase over 1897 is not what had been expected in some quarters. It shows, moreover, that our manufacturers have a work to do, and that preferential treaties such as Russia has concluded with China in the past year are to be reckoned with in the campaign for outer markets. The total of exports for the year was $1,231,329,950, as compared with $1,050,993,556 in 1897. The total of agricultural exports was $854,629,929, against $683,471,139 in 1897; total of manufactured articles, $288,871,449. This is a gain of about $11,000,000 in manufactures over 1897, and of $60,000,000 over 1896 The total of imports was $616,005,159, or half the exports, making the trade balance the magnificent and unparalleled total of $615,000,000. When to the gold balance that flows to our shores from foreign countries is added the probable production of $63,000,000 of gold in 1898, as against $58,000,000 in 1897, it can be appreciated that the foundations are being laid for a period of the most substantial prosperity the country has ever seen.

PERSONAL.

George W. Short, for several years connected with Cleveland foundry interests, died at Dansville, N. Y., July 23. The funeral was held from his late home in Cleveland. Mr. Short was president of the Excelsior Iron Works, Co., Cleveland, and treasurer of the Cleveland Wheel & Foundry Co.

John J. Grant, whose name is well known in connection with the manufacture of ball bearings, resigned from the Cleveland Machine Screw Co., Aug. 1 and will probably embark in the manufacture of machine tools in Cleveland.

Carl L. Holmer, formerly with the Cleveland Ship Building Co., Cleveland, writing from Bergen, Norway, where he is connected with a leading shipyard of Scandinavia says in the *Marine Review:* "We are now able to purchase American ship steel, delivered in Bergen for $1.50 less per ton than we can secure it from England, so that we may be using Carnegie material when the present contracts are filled."

W. Reavell, an English engineer, of the firm of Reavell & Co., Ipswich, Eng., is in this country looking up new methods and new tools for a plant his firm is to build.

Benj. W. Grist, for 12 years connected with the Pennsylvania Iron Works Co., of Philadelphia, as general superintendent, and later as vice-president and general manager, resigned recently to go to Chicago as general manager of the Siemens & Halske Electric Co. of America, in charge of the Western business. In 1877, after 10 years' experience in mechanical lines, Mr. Grist became identified with the Mellet Foundry & Machine Co., of Reading, Pa., as superintendent. Later the firm of B. W. Grist & Co. was organized at Reading for the manufacture of steam engines and general engineering work. In 1886 the firm was merged in the Pennsylvania Iron Works Co.

Willard N. Sawyer, superintendent of the steel plant of the Bellaire Nail Works, Bellaire, O., has resigned to remove to Birmingham, Ala.

Joel Sharp, a prominent manufacturer of Salem, O., died July 29, aged 78 years. He was founder of the Buckeye Engine Co., and its president for years. Before the Salem Wire Nail Co. was merged in the American Steel & Wire Co. he was its president and treasurer.

THE Pennsylvania Tube Works Co. has just received a contract from the Standard Oil Co. for 40 miles of 8-inch pipe, to cost about $150,000. The order will contain between 3,000 and 4,000 tons. The pipe will be used for extensions of the system from the fields to the seaboard.

THE National Tube Works Co. has shipped 2,000 boiler tubes to the Brooklyn Navy yard for the dynamite boat Vesuvius. The tubes are made of the best charcoal iron and are lap-welded.

PAPERS to be presented at the coming meeting of the Lake Superior Mining Institute, which opens at Ironwood, Mich., Aug. 17, include one from E. F. Brown, of Iron Mountain Mich., on "Mining of Ore Pillars;" one from A. J. Yungbluth, of Ishpeming Mich., on "Mine Accounts," and one from J. Parke Channing on a subject to be announced. The indications are that the attendance will be as large as at any of the meetings of the Institute. Wm. G. Mather is president and F. W. Denton, secretary.

AT Pittsburg, Judge Acheson, in United States Circuit Court, gave a decision July 30, overruling the motion for permanent suspension of the injunction in the case of the United States Mitis Co., against the Carnegie Steel Co., Ltd. A temporary suspension was granted, however, pending the taking of the case to the United States Court of Appeals.

THE Oliver mine on the Mesabi range resumed this week after a two weeks shut-down. Only 125,000 tons has been shipped from the mine this year, this including less than the usual amount of ore of the Oliver grade. Preble and Juniata, the third and fourth grades, have predominated. A considerable body of ore high in manganese has been encountered recently, and this led to the temporary suspension of mining. Investigations under way for some time may lead to the addition of the adjoining Ohio mine to the property of the company.

Points in Foundry Practice.

Wrought Iron and Steel Scrap in the Cupola.

TO THE EDITOR:

We are manufacturers of malleable iron for certain specialties. We make no jobbing castings; our iron must be better and closer in the grain than jobbing castings. The view has been advanced that it improves castings to add a certain amount of wrought and steel scrap, and something has been done on this line in our foundry. It is the writer's belief, however, that no direct benefit is secured from this practice; that the mixture is not improved; and further, that you do not get out what you put in the cupola, because it will not mix with charcoal pig, at least not enough to pay for the wastage. In short, allowing for the proper waste in mixing pig metal and the gates, if we had 1,500 lbs. of pig iron, 500 lbs. of gates and 250 lbs. of wrought and steel scrap, would there be anything added to the 2,000 lbs. of iron by the 250 lbs. of wrought and steel scrap? The writer claims that it does not help the iron to put this scrap in, and that you do not even find it in a proportionate amount of castings made. We would like to have the opinion of others about the matter.

MALLEABLE.

Necessity of Sharply Watching Foundry Delays.

TO THE EDITOR:

In these days of keen competition in the foundry business, it behooves every superintendent and foreman to be on the alert and to scrutinize closely every item. Let me mention one that is related in an important way to the successful running of a foundry:

When the drawings for a pattern go to the pattern shop, it should be the duty of the foundry superintendent to look them over and tell the foreman pattern maker how he wants them made. This, to facilitate matters in the foundry. If any rigging is to be made ready in the foundry for the making of the casting, let it be seen to that it is at hand. If the piece is to be made in a flask, have the flask ready. If it is to be made in the floor, let the pit be dug out. If there is a coke bed to be put in, have the cinders or coke ready. Much time is often lost while the laborer is out after coke. It is not a bad idea to tell the molder who has been selected for a certain piece of work, a day or two in advance of starting upon it, so that he can settle in his mind how he is going to make it. There are patterns that require some study before deciding how to take up the work.

I have referred to these points because the time that is required to make the first casting from a given pattern is put down as the time required on that job in the future. As every one knows, who has served any time in the foundry, the second or third piece can be made more quickly than the first. Competition is so sharp that the delays incident to the first handling of the pattern must be reduced to a minimum, and every effort made to counteract the methods that are in vogue with the men in some foundries.

J. J.

Another Word on Semi-Steel.

TO THE EDITOR:

Of late there has been very much written for and against "semi-steel." Noting an article by Major McDowell in your issue of July 21, which gives some of the history of the introduction of this material, I give herewith some additional reminiscences which will throw light upon the real origin of the much combated term "semi-steel."

The first practical knowledge on the subject of mixing steel scrap with pig metal to strengthen the resulting castings dates back to late in 1870, when Mr. Hamilton made a mixture of steel scrap with anthracite and charcoal irons, for car wheels. At the time it was used in Altoona and some other car wheel foundries. The process had been patented by Mr. Hamilton a year before. Mr. George Westinghouse called my attention to the matter, our firm being then Bagaley, Young & Co., and we tried this mixture for rolls with remarkable success. The late Andrew Kloman was impressed with the idea so favorably that he ordered all rolls for Carnegie, Kloman & Co. to be cast from this mixture.

The question arose, what to call this material which was not steel and yet much stronger than cast iron. Moreover, we got a higher price for it than we did for the best charcoal iron castings. It was decided to call it "semi-steel," and I believe that this was the first time a mixture of iron and steel got this name. Shortly after this, McConway & Torley made use of the same mixture for casting their "semi-steel" brake shoes. Others started to make hammer dies, wheel castings, etc., and the material never received any other name.

Ever since it was patented, the Seaman-Sleeth Co., successors to Bagaley, Young & Co., have been using this mixture. We are doing so today with equal success; and while we do not claim any special metal, we do claim greater strength for the iron and a closer grain, when used in proper proportions with good charcoal irons.

J. S. SEAMAN.

Pittsburg, Pa.

Chemical Composition of Wheel Irons and the Thermal Test.

TO THE EDITOR:

In one of our technical journals, I notice a report of Mr. Bush, on thermal tests for car wheels, I have read it with much interest, as the furnace of which I am manager makes a specialty of car wheel iron. It is a pity that these tests were not given in a little fuller form. Mr. Bush gives only a group of 20 wheels, 10 of which stood the test, and 10 of which did not stand the test.

From the figures given, Mr. Bush draws the conclusion that there is no evidence of chemical composition to show that the chills of wheels which stand the heat test differ from the chills of wheels which do not stand the test, so far as their properties depend on the chemistry of the metal. It is unfortunate, as I said before, that full chemical analyses were not given. Certainly there is nothing in the tables of carbons furnished to indicate the difference, but may there not have been in some of the other elements?

The result of a great number of experiments carried on at this place, under my supervision, would seem to indicate that both phosphorus and sulphur have a very marked effect on the ability of a wheel to stand the thermal test. We have found that if the phosphorus runs much over .40, the interlacing chill feature, which is characteristic of good wheel iron is absent—this, with normal sulphur. We have found, though, still further, that high sulphur, i. e., much over one-tenth, has a distinctly deleterious effect on the chill, seemingly neutralizing to a large extent the effect of the low phosphorus in causing an interlacing chill. Furthermore, there are two ways of getting a chill: One, and a correct one, is to use low silicon, low sulphur, and low phosphorus, making silicon the ruling element; the other is to disregard, to a certain extent, both silicon and phosphorus, and obtain the chill by means of sulphur. The latter chill presents one broken and straight line, or demarkation, between the gray and chilled irons.

There is very little question that the strains in the chilled portion of the iron are greater than in the gray. This being the case, unless fingers of chilled metal run down into the gray metal, it is very easy to see that the thermal test would cause the white iron to crack away from the gray.

Without wishing to pose as an authority on the manufacture of wheels, I may add that I have understood from some of the users of this test, that wheels made of the proper kind of metal, with a good interlacing chill, do not yield to the thermal test, but that wheels made with very high sulphur, and high phosphorus, are exceedingly apt to do so.

Embreville, Tenn. GUY R. JOHNSON.

THE National Safe & Lock Co., Cleveland, has been fully occupied in every department for several months and is now three months behind its orders, though working over-time. The company has had great success with its burglar and explosive proof bank safe, with cannon breech circular screw door. It is provided with triple time lock and permanent dynamite locking feature. The circular door is so built that it fits tight, making the body of the safe and door practically a solid mass of drill-proof chrome steel.

THE Oster Mfg. Co., Cleveland, manufacturers of chucks and tools, expect to remove shortly to the I. N. Topliff Mfg. Co.'s building on East Prospect st. The facilities of the company will be enlarged by the change.

A NEW ROD MILL AND ITS ECONOMIES.

TO THE EDITOR:

In order to show the keen competition that exists in the manufacture of steel, I wish to call your attention to the following regarding the condition at Columbus, O. While there last week I practically closed negotiations with Messrs. King, Gilbert & Warner for a Garrett rod mill of the most modern type.

It is intended in this mill to start with a billet five inches square in cross section and take it direct from the billet mill, after being cut into lengths at the shear, to a heating furnace, where it is given a light wash heat; then, by means of the most improved methods, this bloom is delivered direct into the rod train. In the past, Messrs. King, Gilbert & Warner have shipped the major part of their production to wire rod mills in Cleveland, in the shape of four-inch billets, which, after being rolled into rods, have been reshipped right through Columbus, to a large wire mill in Cincinnati. Owing to the keen competition in four-inch billets, this seesawing in the transfer of freight could not be tolerated. The freight on the billets from Columbus to Cleveland is 65 cents per ton and the freight on rods from Cleveland to Cincinnati is $1.20 per ton, making total freight of billets to Cleveland and rods from Cleveland to Cincinnati, $1.85 per ton. Now, had the wire rods been manufactured at Columbus, the freight from Columbus to Cincinnati, 55c per ton, would be only the expenditure for transportation, showing a clear saving of $1.30 per ton in freight. There is a further saving of about 50c per ton in the manufacture of wire rods, when taking the hot billet, which is rolled from the initial heat of the ingot, and rolling this billet before it is cold into wire rods, making a saving of $41.80 per ton in favor of making wire rods in Columbus.

It may be said there are already too many wire rod mills in this country, which can now produce far more than we can at present consume. True; but are they correctly located to avoid this duplication of freight charges, and in such position relative to the steel mills as to take advantage of the initial heat of the ingot? In Columbus, there is located the Columbus Buggy Co., and in its warehouse can be seen a buggy tire that was rolled by a well known firm in Pittsburg, from four-inch steel billets manufactured in a steel works in the immediate vicinity of Cleveland. Here is but another instance of cross purposes in the manufacture of steel; but all this will be straightened out by the keen competition of the future.

The day is not far distant when no firm that makes pig iron can afford to let it leave the works until it has taken advantage of the initial heat of the metal in every stage of manufacture, to put it into a marketable shape, which is entirely feasible in the case of merchant steel and wire rods. And while at the present time the outlook for some of the manufacturers of pig iron in this country is dark, owing to the fact that all who are in the manufacture of steel are taking steps to supply themselves with pig metal, leaving Bessemer pig iron manufacturers, as it were, without a market, still the logic of the situation indicates that the pig iron manufacturers are in much better condition to face the future than those who have to buy their raw material and put in into a finished state, for the reason stated above.

Cleveland, Aug. 1. WM. GARRETT.

To Smelt Michigan Ores by Electricity.

The Norway Electric Co., which holds an electric lighting franchise from Norway, Mich., is erecting a plant midway beween Norway and Quinnesec, Mich., at a point at which iron ore has been uncovered in recent explorations by Benjamin High. The plant consists of a 75 h. p. gas engine built by the Frontier Iron Works, of Detroit, driving a 2,500 light (16 candle power) machine of Westinghouse type. A 10-ton furnace is to be put in, in connection with the plant, for experiments with electric smelting of iron ore. F. E. Hatch, an electrical engineer of Detroit, who is developing the process, claims to be able to manufacture pig iron and blooms direct from ore, by the use of electricity. The ores to be experimented with run high in silica, about 50 per cent in iron and very low in phosphorus. The company consists principally of Detroit investors. The officers are: President, W. R. Griffin; vice-president, E. C. Geaves; secretary, George A. Morrison; treasurer, A. S. Hatch.

THE TIN PLATE MARKET.

The market continues as it has been through July—unsettled, with comparatively little done in the way of future contracts, with the exception of a few sales for Western delivery.

The lack of demand has resulted in a material weakening in prices for deliveries after September. Buyers are making the most of the prospective situation, arguing that with the completion of several large mills, now being built the productive capacity of the country will far exceed the total requirements in tin plates and that prices must be brought down to the lowest possible point. As an offset to this it is a fact that all of the mills are busy and would be making more tin plates today than they are, if they had not been delayed more or less in receiving tin bars from the steel works. There are no stocks either in dealers hands or at the mills, and it is generally known that many orders have been cancelled because of failure to deliver on time. This has had comparatively little effect on the market for near-by deliveries, as these prices have been effected in sympathy with the quotations on far futures. There is no probability that there will be any surplus strocks of tin plates before Oct. 1. The canning trade will probably require larger supplies of cans than as yet have been contracted, as the indications both East and West are favorable for a large pack if the weather holds good. If there is much additional demand from this source, undoubtedly every available box of tin in can sizes will be sought out and during the next six weeks should bring a fair advance over the quotations current to-day. It is reported that the fruit crop on the Pacific Coast is a great disappointment this year; that the price of fruit is unusually high owing to the small crop, and that many of the large can makers will carry over unused a considerable quantity of tin plates.

The market stands f. o. b. Pittsburg and Indiana districts, August and September, 100 lb. cokes $2.70, with 5c to 10c reduction from this price for later deliveries.

The Record-Breaking Ore Cargo.

The John Fritz, whose record-breaking cargo of 6,959 gross tons out of Duluth was noticed last week, carried the load on a draft of 17 feet 1¹/₂ inch. Manager L. M. Bowers, of the Bessemer Steamship Co., says in the *Marine Review* that the highest estimate the company had of capacity from any of the lake shipbuilders, on the dimensions and weights proposed was 6,500 gross tons on 16 feet 10 inches draught. The *Review* says: "It has been claimed in all parts of the lakes that the three vessels of the Bessemer company that have been under construction at West Bay city were entirely too heavy for requierements in the lake trade; that they were so loaded down with material, in order to gain great strength, that there would be a marked loss in their capacity as compared with other vessels of about the same dimensions. It is a fact that these three vessels contain full 8,000 tons of material; that is, hull material, irrespective of machinery, boilers, or equipment of any kind. This is said to be about 25 per cent more material than has been used in some vessels that are well up to the dimensions of the new West Bay City ships. The policy of making these vessels so strong involves, of course a great many considerations, not least of which is safety in operation, and the probability of the larger steamship lines meeting with conditions later on that may prompt them to undertake their own insurance."

The Samuel F. B. Morse, a consort of the John Fritz, was launched at West Bay City, July 31. She will probably take a larger load than the Fritz. The two barges and the steamer, which is also nearing completion at the Wheeler yards, are reckoned to be capable of carrying 21,000 gross tons, running together.

THE Kansas City Bolt & Nut Works have secured injunctions against a number of their striking employes. The court enjoined the strikers from interfering with the new workmen. The company also petitions to have the strikers prevented from attempting to persuade new men to quit work and from loitering in the vicinity of the plant. Injunctions almost as comprehensive in their character were granted by Cleveland courts in connection with strikes at the Brown Hoisting & Conveying Machine Co.'s works, and the Consolidated Steel & Wire Co.'s plant.

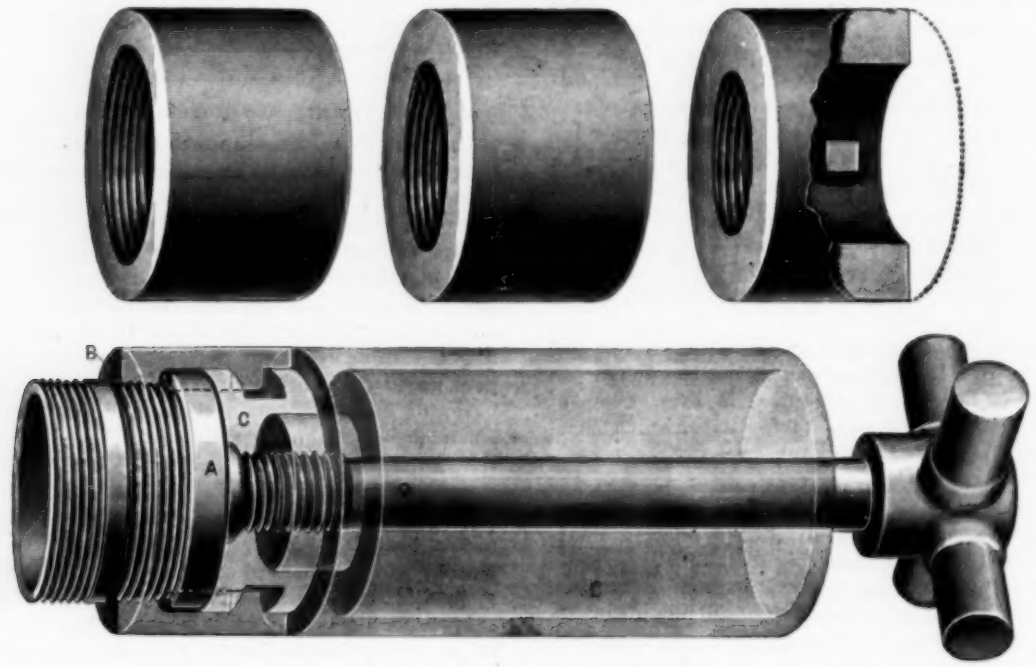
LAKE SUPERIOR IRON MINES.

The closing of negotiations for the acquisition of the Zenith mine by the Oliver Iron Mining Co., and the practical conclusion of the deal that has long been pending for the purchase of the Pioneer mine by the same interest, are the important developments of the past week in Lake Superior iron ore circles. H. W. Oliver has been at Duluth for more than a week past in connection with details of the transfers. The Zenith mine is purchased by the Oliver company from the Zenith Ore Co., in which the controlling interest has been held by Frank Rockefeller. In 1897 the mine produced 40,817 tons, and in the preceding year, 18,765 tons. Nothing was done in 1894 and 1895; in 1893 the output was 14,388 tons and in 1892, the first producing year, 14,991 tons. The total output is 88,961 tons. It is expected the mine will be put in shape to produce at once, and that 50,000 tons can be taken out this season. Considerable water is made by the Zenith and the pumping problem has had not a little attention. The extent of the deposit is a question that has not been thoroughly determined. In the eastern portion of the Chandler ore body the ore pitches under a capping of jasper and extends on to the Pioneer property, where it is found at a depth of 400 to 800 feet. The Zenith, which is just east of the Pioneer, has the jasper and iron ore of the other two properties. Later development work has shown a larger amount of ore than was supposed to exist in the earlier operation of the mine. The jasper belt is wider on the Zenith than on the Pioneer. Opinions differ as to the value of the property. The quality of the ore is excellent; the company in which it is found would indicate that, to begin with. The new purchasers appear to be satisfied, in view of recent exploration, that the mine is a fair purchase at the price paid.

The Pioneer has been much discussed in the past year, since the first overtures for its purchase by the Oliver company. From time to time in the past four or five years its sale to the Minnesota Iron Co. has been rumored. It has been equipped with excellent hoisting and pumping plants within two years and is in shape to make a large output. A four-compartment shaft is down about 1,000 feet and a good body of ore has been thoroughly opened up. Shipments were 207,103 tons last year and 149,073 tons in 1896. The total since the mine opened is 417,116 tons. The Pioneer product of last year averaged 64.80 in iron, 4.19 in silica, .036 in phosphorus, 7.47 moisture. Zenith ore runs 65.03 in iron, 3.82 in silica, .051 in phosphorus and 5.04 in moisture. It will be recalled that the Pioneer mine closed down last December. With only nine years remaining of the leasehold period, the Carnegie-Oliver interest was unwilling to buy control in the Pioneer Iron Co., and the fee-owners asked what was considered an exorbitant bonus for extending the lease at that time. It is understood that a settlement of differences has been secured, the lease being extended a satisfactory length of time to warrant the purchase of a controlling interest in the mining company by the Oliver Iron Mining Co. The Pioneer Iron Co., is capitalized at $1,000,000 in $25 shares. The original royalty was 50 cents, but a reduction was made in recent years to 35 cents.

While there is no development as yet, in the hearing of the Mesabi and Vermilion ore rate case at Duluth, which would indicate the character of the decision, a newspaper interview with one of the commissioners shows an apreciation of one phase of the situation, at least. Gen. Geo. L. Becker is thus quoted: "Any one who thinks that the iron range railroads and ore docks have been built without an enormous outlay of money is greatly mistaken. The cost has been very large, and the benefits that have accrued to the country as a result of the big enterprises have been almost beyond computation. Without the roads the mines on the Mesabi ranges would be valueless. Naturally the production of so enormous a quantity of iron ore as has been taken from the Minnesota ranges has reduced the priceof the product, but while the market value has gone down, the market has been widened, and the consumers of iron of all kinds have been benefited. The development of the Minnesota iron deposits has made it possible for American iron manufacturers to do a large export business, and this business will undoubtedly continue to grow. The growth of this industry in Minnesota has been simply marvelous, and it has been made possible only by the investment of the enormous capital that has been employed by the large companies that have been operating on the ranges."

It is reported that the Lake Superior Consolidated Iron Mines have taken another option on the Rouchleau mine. A few years ago the company optioned the same property but did not close. The price now under consideration is $500,000, against $1,250,000 under the original proposition.



NIPPLE HOLDER FOR PIPE FITTING.

NIPPLE HOLDER FOR PIPE FITTING.

The inconveniences and difficulties of cutting and threading a nipple, in pipe fitting, led to the designing of the nipple-holding device shown in the illustration. A transparent view is given which indicates the construction and working. A socket B of proper size for the pipe to be held is secured to the body C by a one-eighth turn, and the screw D is run forward by a wheel provided at D. The nipple is then screwed into the socket, as shown, but is so arranged that it bottoms on the plunger A before it jams in the thread and is thus held secure. To release the nipple, a part of a revolution of the screw D will allow it to be removed by the fingers. The holder can be used either in a vise with a common die stock or with any of the pipe machines now in the market. To meet the requirements also of the common style of over-hung spindle machines, the manufacturers have employed the same principle in a holder adapted to their use. The manufacturers are Curtis & Curtis, of Bridgeport, Conn.

WESTINGHOUSE ENGINES FOR LONDON.

About 450 manufacturers, engineers and others representing Pittsburg industry and capital, accepted the invitation of the We-tinghouse Machine Co. and the Westinghouse Electric & Mfg. Co., to visit their works at East Pittsburg on Saturday afternoon, July 30. Particular interest attached to the occasion, since the machinery, the inspection of which was the special object of the trip, was about to be shipped to London, and because it included not only electrical apparatus, which it is no new thing for England to order from the United States, but also the engines to drive it. To send from London to the United States for large steam engines is indeed something out of the ordinary. The shipment in question, which the visitors regarded with great interest, consisted of three 2,500 h. p. generators, direct connected to three 2,500 h p. engines and the buyers are the Metropolitan Electric Supply Co., of London. This is the greatest electric lighting company in Europe, and its present contract with the Westinghouse interests calls for "three compound two-phase steam alternators," each consisting of an enclosed vertical compound engine with the armature of the genertor coupled direct to the engine crank-shaft, the engine and generator being mounted on separate bed plates.

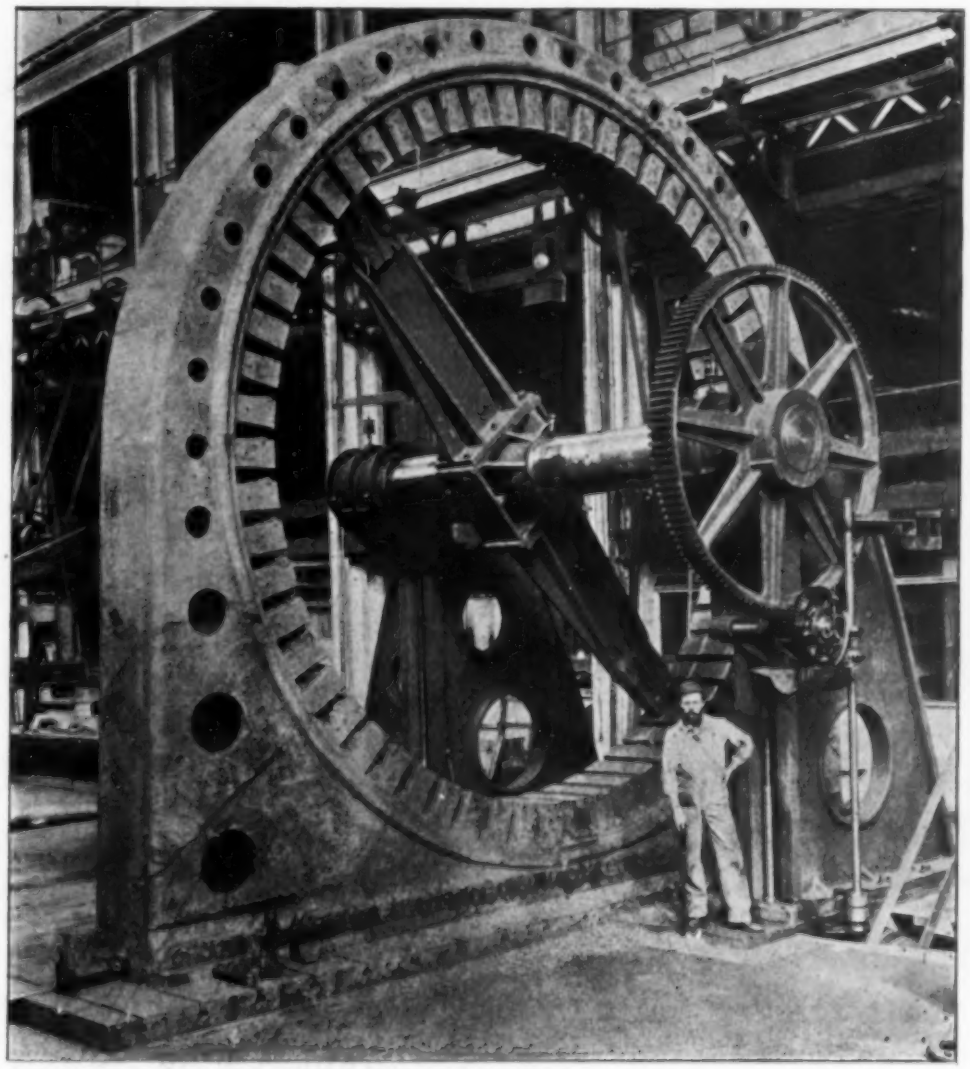


FIG. I.—BORING THE FIELD OF A 1,500 K. W. GENERATOR, TWO-PHASE ENGINE TYPE.

The engines are of the enclosed vertical compound marine type and are the most powerful yet built at East Pittsburg. The crank-shaft extends so that the armature may be mounted directly upon it; thus serving as a fly wheel. The space occupied by one engine and generator is 29x12 feet. The engine weighs about 210 tons. The weight of the generator is 173 tons, 35 tons being in the armature. When the engine is operating non-condensing, it can develop the full rated power of the generator, or 2,500 h. p., at 133 revolutions per minute, with 100 lbs. steam pressure on the engine valves. At 120 revolutions per minute, with 140 lbs. steam pressure, the engines are capable of delivering a maximum of 3,500 h. p. All parts are built to withstand a steam pressure of 200 lbs. to the square inch. The high and low pressure cylinders are 36 and 55 inches diameter, respectively, and 36 inch stroke. Steam is admitted into the high pressure cylinder by one double ported piston valve, and into the low pressure cylinder by a pair of single ported piston valves. The crank shafts are of forged steel, 14 inches in diameter at the bearings, and 20 inches in the armature, with a hole through their entire length. The throttle valve is operated from the working platform by a hand wheel. The main bearings of the engines are water cooled, and are of the quarter box type, adjustable in any direction by means of wedges which can be adjusted from the outside of the bed plate. They are of cast steel and bronze, lined with best babbitt metal, and are 14 inches in diameter and 28 inches long. The electrical apparatus accompanying the engines was built by the Westinghouse Electric & Mfg. Co. It consists of three direct connected alternating current generators, each having a nominal output of 2,000 h. p. and delivering two-phase currents at a pressure of 500 volts. The field is provided with 62 inwardly projecting pole pieces, these poles being built up of laminated steel sheets. The frame is split vertically, allowing the halves to be moved back on the bed plate, so that the armature may be thoroughly inspected. The field coils are wound with copper strips bent on edge and thoroughly insulated. The armature spider is of cast iron, built in halves. This feature greatly facilitates shipping operations. The arms of the spider are cast with splitting plates between them to insure freedom from strain in cooling. The arms are secured in position on the crank shaft by two heavy mild steel rings shrunk around the bosses at the base of the arms. The commercial efficiency of each generator is 95 per cent at full load, 94 per cent at three-quarters load, and 91 per cent at one-half load. The combined efficiency of engine and generator is 90 per cent at full load. There is one direct current multipolar exciter to each

generator, which is arranged for direct connection to the engine shaft.

It is expected that the Metropolitan Electric Supply Co., which is planning new central stations and newly equipping old ones, will require further engines and generators, which the Westinghouse companies will be asked to supply.

Two other special objects of interest engaged the visitors of last Saturday, who also found pleasure in a general inspection of the great plants. These were the gas engine and steam turbine departments of the Westinghouse Machine Co. In the former engines of 10 to 200 brake horse power for electric lighting are manufactured. The type has been described and illustrated in these columns. The special feature is the action of the governor in controlling the quantity of explosive mixture that is taken into the cylinder. The company has built a number of direct connected rigs, the dynamo being mounted rigidly on the end of the engine shaft. The largest gas engine in the world has been built by the company—one of 650 brake horse power. It has three cylinders each 25 inches in diameter, and a 30-inch stroke, and runs at 145 revolutions per minute. Its economy is very marked, resulting in the production of a brake horse power for 11 cubic feet of natural gas.

The Parsons steam turbine, driving a 200 h. p. alternating current generator, presented a new form of steam engine, though its principle is old—the use of the high velocity attained by steam in passing through an orifice, from a higher pressure to a lower. The Westinghouse Machine Co. is now prepared to build Parsons turbines which give extraordinary results, as compared with steam engines of usual types. The engine consists of: A barrel, in the internal bore of which are fitted numerous rows of turbine blades; a shaft, which revolves within the above barrel, having complementary blades fitted to the periphery; bearings; and lubricating and governing devices. The barrel and shaft together form a series of hundreds of complete turbines. The steam passing from one to the other expands itself and does work in each set until it arrives at the exhaust end, when it is entirely devoid of energy. The turbine seen at East Pittsburg Saturday, runs at 4,700 revolutions per minute without any perceptible vibration. This speed, however, is not limited in any way. It may be either higher or lower. The bearings admit of any rotative speed desired.

After the inspection of both plants the visitors were entertained with a collation. Later a demonstration of the efficiency of the Baldwin-Westinghouse electric locomotive was given in the use of one of them to convey the train to Wilmerding; thence the whole party returned to Pittsburg.

THE Embreville Furnace, Embreville, Tenn., was blown out in May. Ceased filling at 12 P. M., on the 21st; last cast made at 3 A. M., on the 23d. Filling was begun at 6 A. M., July 21; first cast was at 3 A. M., on the 23d—good malleable iron grade No. 3. In the intervening 60 days, the furnace was completely remodeled. The mantels were raised 4 feet 1½ inches, and a new mantel, consisting of three curved 15-inch I-beams, and heavy cast iron plate, put in place of the old one. Five new rows of sheets, more than twice as heavy as the old ones, were put on the jacket, and the remaining part reinforced by 7x1 bands riveted around inside. The furnace has been furnished with 16 tuyeres, and seven rows of bronze coolers. The latter are of a special type, devised by Guy R. Johnson, the general manager. Their special feature is that they are much easier to remove than the ordinary type, and cost about half as much. The blowing engines and boilers have had full repairs, and a complete new lining from top to bottom has been put in the furnace. The company has orders on hand covering the output of the next four months.

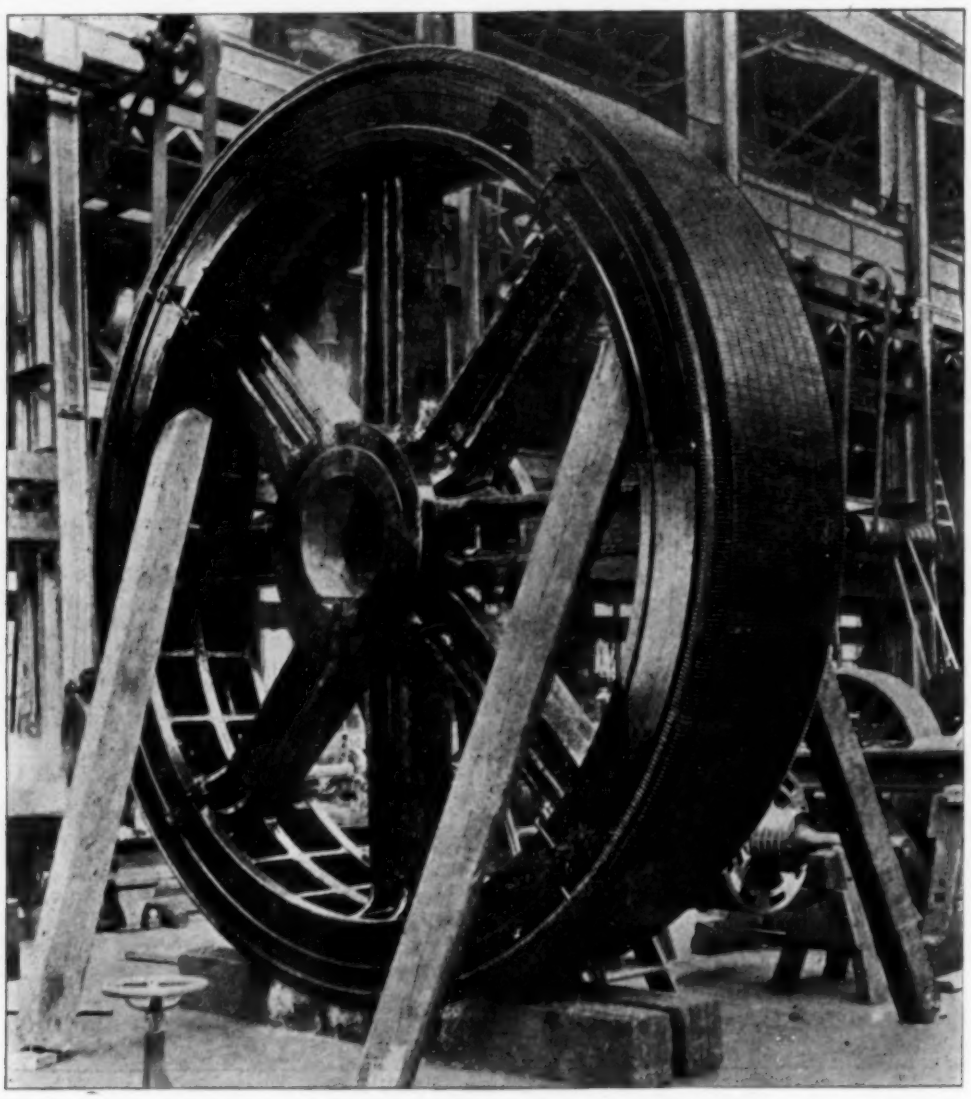


FIG. 2.—ARMATURE OF A 2,000 H. P. GENERATOR.

TYRONE, PA., is making an effort to secure a steel mill.

MANAGEMENT OF BLAST FURNACES.*—III.

BY E. S. COOK, POTTSTOWN, PA.

Modern Construction.

With more intelligent management the common blast furnace construction previous to 1880 was found inefficient. The changes were gradual, experimental, groping in the dark, as it were. Each change was made to overcome some special difficulty, as the necessity presented. Probably this side of the subject can be best illustrated by giving a short sketch of the operations of the Warwick furnace. This furnace was first started in 1875. From 1875 to the summer of 1877 it was in charge of experienced founders, of good reputation; but one scaffold followed another, varied by chilling, about every six months, so that the company was brought to the verge of bankruptcy. The causes were various, but chiefly the lack of knowledge of the material used. The ores used mined by the company were of different composition from those usually employed in the Schuylkill valley at that time. The largest product of iron for any one week was 190 tons, which represented the average best work of furnaces of the same size in the vicinity. The weekly average, however, of any one blast barely exceeded 50 tons per week, for the reasons mentioned.

In November, 1877, the furnace was placed in my charge. No changes in construction were made except the substitution of a 7-foot bell in the place of a 5-foot bell. In blowing in, the furnace started excessively hot, causing me much anxiety, but it proved a blessing in disguise, as was demonstrated a couple of years later. A graphitic coating was formed on boshes, or a scaffold evenly distributed, preserving the brick work without interfering with the working of the furnace. The bosh walls following the construction of that period, were about 3½ feet thick. In the course of a few weeks, the furnace reached a weekly make of 300 tons and over, an unheard-of product at that time for an anthracite furnace of its size. It created more local excitement and interest than a make of 1,300 tons does now. When congratulated I replied that I was sorry, as I was afraid that a standard had been made that could not be reached again. We ran 105 weeks without special incident when the inwall gave way, terminating the blast. The average weekly product was 357 tons.

The furnace was relined, maintaining the same construction, and blown in March, 1880. My troubles now commenced, 1880 being an eventful year. It was a life-and-death struggle, not only for me, but the new method of management was on trial also. I had earned the jealous hatred of the old school, and my troubles were a source of no little satisfaction to many. The furnace was blown in March 28, 1880, care being taken not to allow the furnace to start so hot, or gray as it is termed, as the previous blast. A good start was made, the product averaging 368 tons per week, but we only ran six weeks. A new furnace disease was developed. Symptoms were not wanting, but their significance was not appreciated until some months later. No serious irregularities were experienced, until upon a certain night following an unusually large cast, the stock settled a few feet from the top, a common occurrence. Following each cast a stoppage was then necessary to close the iron tapping hole. On starting the engine it was found that the resistance to blast entering the tuyeres was so great that the engine was barely able to run. Gas failed, steam became short, necessitating heavy firing. The tuyeres became a dull red, showing partially fused iron and slag. Melting practically ceased. Communication between tuyeres, cinder notch and

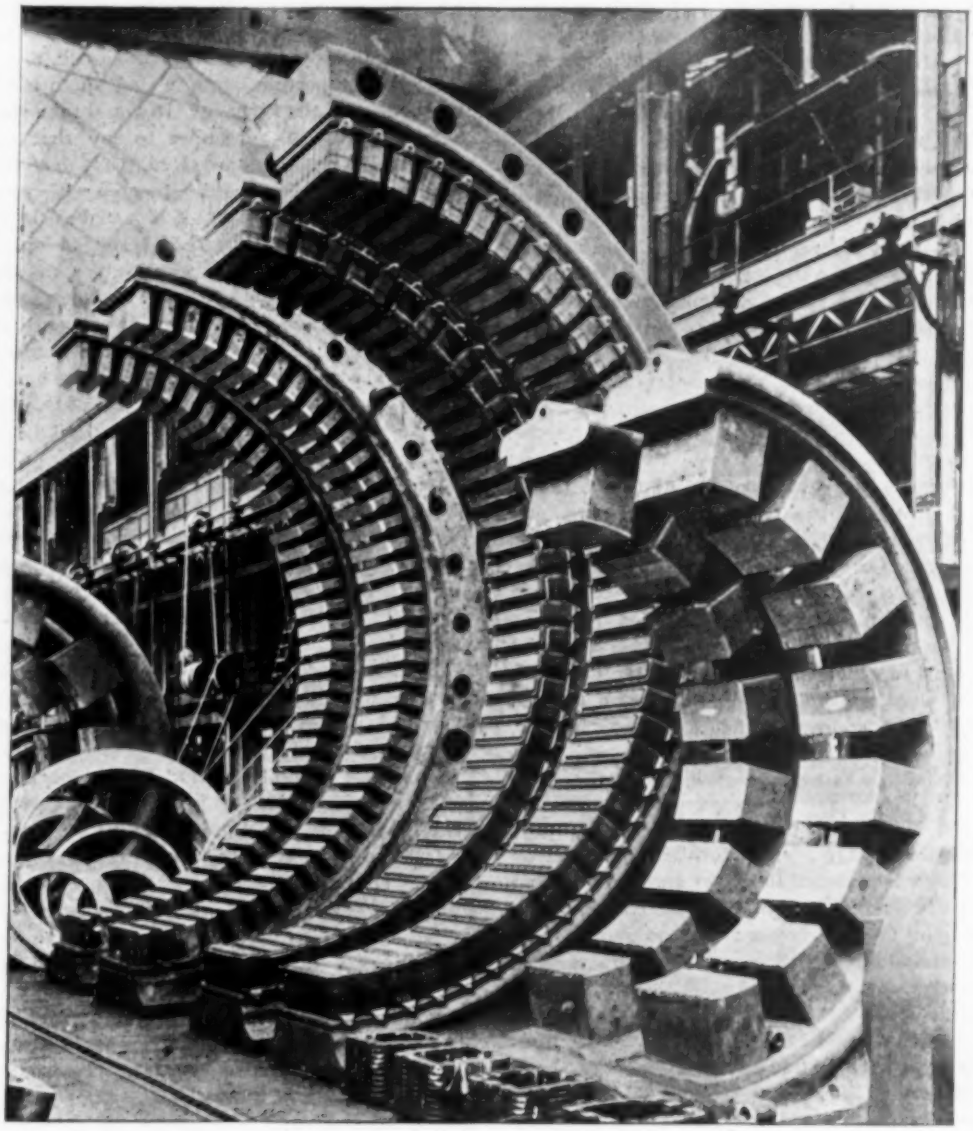


FIG. 3.—COLLECTION OF FIELDS, READY FOR ASSEMBLING.

* A lecture delivered to third year students in metallurgy in the Schools of Mines and Chemistry, Columbia University.

iron notch was cut off. With 14 pounds pressure at the tuyeres, scarcely any flame was perceptible at the open iron or cinder hole. Some of the tuyeres became solid; others melted slowly. The liquid, not being able to sink into the crucible, formed a column of sufficient weight to overbalance the air pressure in the tuyere pipe and flowed back and filled the pipe with a mixture of slag and iron.

After struggling day and night for several turns I was forced to admit that the furnace was chilled. We proceeded at once to empty the furnace. In cleaning out, it was noticed that from the tuyeres upwards for a distance of 10 feet or more the contents were a mass of finely divided dirt, analyzing 47 per cent coal, 46 per cent ore and 7 per cent limestone. Above this mass of dirt the stock was in good condition. Below the tuyeres the crucible was filled with dirt, offering no difficulty to remove. There was no iron to contend with. When the furnace was finally emptied, measurements were taken, showing the inwall above boshes to be in good condition, and of about the same dimensions as when blown in, but the bosh walls were completely melted, only a light shell on the outer course remaining, about 9 inches thick instead of 42 inches. It was assumed that the brick used were of poor quality, but this explanation, while the best that could be given at the time, was not satisfactory to me, nor probably to any one else. There was no evidence of a melted scaffold such as previously described, and "dirt scaffolds or dirt troubles" had not then received a name. During this short blast we made mill iron, and my critics asserted that I was running for the sake of a record without regard to the durability of the furnace and that no furnace could stand such treatment.

Repairs were made, a new bosh with different make of brick being constructed. The furnace was again blown in Aug. 27, 1880. This time I aimed to make foundry iron to meet the criticisms mentioned. It was generally understood that foundry iron formed graphitic protections to the bricks and to this extent prolonged their service. This was undoubtedly true when combined with large fuel consumption and small product, but fortunately or unfortunately for me our product of foundry iron averaged 382 tons per week, a larger weekly product than had yet been reached. In nine short weeks we had a repetition of the previous blast almost exactly. In the midst of the best working and largest yield, with scarcely any warning, the furnace was again chilled. Precisely the same conditions were found to exist as before, only more so. The loss of brick work extended higher up the boshes, the mass of dirt being proportionately greater.

Trouble Due to Dirt.

To say that I was discouraged, does not begin to portray my feelings, but I was determined to kill or cure. In cutting away the brickwork below the mantle, in order to make an opening to remove the stock, I noticed that as soon as the workmen penetrated and air was drawn in through a small hole cinder commenced to trickle down. As the opening was enlarged, the stock was shown to be white hot and in good condition. It then occurred to me that the whole trouble was due to the dirt, and if the dirt had been removed though the tuyeres by ravelling out we would have been saved much hot and hard work and the furnace might have continued in blast. At the time, however, it was too late. When the furnace was emptied, the boshes were found to be completely destroyed, but the inwall was in good condition. While discouraged, I was not hopeless. I was now satisfied that all my efforts would prove of no avail unless some means could be provided to preserve the boshes. The walls being thick, as they melted, the area above the tuyeres greatly enlarged. The cavities thus formed filled with "dirt," or finely divided ore and coal.

The volume of air blown was not sufficient to fill and keep active the enlarged area. The chilling was due to this mass of dirt being dislodged and settling into the crucible, thus preventing all contact between the air and fuel, the temperature being just sufficient to form a pasty, semi-fluid mass. My idea was to hold the bosh walls intact and maintain their shape and dimensions. Mr. P. L. Weimer, of Lebanon, one of the most progressive and intelligent furnace constructors of his time, became deeply interested, and, as a result, the first instance of a water-cooled bosh, in this section at least, was constructed. This was accomplished by employing a series of vertical pipes encircling the entire bosh and in height about 15 feet above the tuyeres. They were placed against the old shell of brickwork and only a lining of 9-inch brick was used in front of them. Many were the criticisms as to the absurdity of attempting to run a furnace encircled with a flowing stream of water.

The furnace thus constructed was blown in Dec. 15, 1880, continuing in operation 245 weeks, showing a larger product for the blast than had ever been made by an anthracite furnace, the average weekly product, including many stoppages, and delays, being 416 tons and the total make about 102,000 tons. Thin bosh walls had been previously used in Germany, but had not attracted much attention in this country. This blast, terminating Sept. 1, 1885, was not without many incidents of interest and of much hard work, giving opportunity to study the "dirt trouble" or "dirt scaffold," and to become familiar with the symptoms and guard against serious consequences.

By maintaining the size of the bosh, the "dirt" was prevented from accumulating in such quantities as to endanger the safety of the furnace. It would take too much time to go into futher detail, but suffice to say that the folly of thick bosh walls was demonstrated, thus leading to the present construction of thin walls protected with rows of bronze bosh plates, which method was elaborated in the west.

"Dirt troubles" were recognized as one of the conditions co-incident with the new practice of comparatively large product and comparatively low fuel consumption, but more particularly confined to the use of anthracite coal. They, however, are not unknown to the coke furnaces. By close watching we are now able to control them, but so far have not succeeded in preventing the formation of the dirt.

The blast commencing December, 1885, was of 180 weeks' duration, averaging 598 tons per week. New and larger iron stoves were added to the equipment during the repairs, enabling a larger volume of air to be blown than previously. This, together with the use of one-quarter coke addition enabled us to increase our product. We had our "ups and downs," the average results, however, being fairly satisfactory. The bosh coils were used to maintain the shape and size of the boshes, 18 inches of brick being placed in front of them.

The blast October, 1889, to July. 1892, lasted 144 weeks, averaging 744 tons per week. A new stack had been constructed, 70 feet high, instead of 53 feet, and bosh walls 18 inches thick, protected with water coils and strengthened with a bosh jacket. We had several serious "dirt troubles." With each improvement in construction, designed to overcome the troubles, the product of the furnace was increased so that relatively we were in the same position in this respect as before. However, while we could not prevent the accumulations, we learned to handle them to better advantage.

Several times during this blast we were obliged to use oil blowpipes to melt out chilled tuyeres and open the iron tapping hole, closed with chilled iron, remove the tuyere and ravel out the stock which consisted chiefly of fine dirt.

For several days little or no merchantable iron was made, but finally in each instance the furnace was restored to normal working condition.

During the blast from Oct. 1, 1892, to September, 1896, 206 weeks, we made a product of about 204,000 tons of iron, using half coke and half coal as fuel.

In the first six months we had several serious experiences from "dirt," due in great part to over-confidence in the high heats of blast from our new brick stoves and the larger use of coke. It was assumed that the high heats of blast possible with brick stoves, as compared with cast iron pipe stoves, would enable us to contend with "dirt accumulations" without taking the usual precautions. Greater confidence was also felt in the bosh construction, we having substituted bronze bosh plates for the water coils. Only four inches of brick work was in front of the bosh plates so that the bosh could only enlarge eight inches in diameter, thus leaving less room for the lodgment of dirt. During the first six months we learned that this confidence was misplaced. Our old enemy was as much in evidence as on previous occasions. Our weekly product of iron reached 1,000 to 1,100 tons. The dirt accumulation formed higher up, lodging at the top of the boshes, above the bosh plates in the widest part of the furnace.

Bosh Plates Not Responsible for Trouble.

Neglecting in a measure our usual precautions and taking chances or risks, we suffered in consequence. The average furnace employe is naturally conservative, opposing on principle every innovation and charging every trouble to any new device or construction that may have been adopted. He forgets the past and is constantly citing the "good old times," as better educated and better informed people are in the habit of doing. The new bosh plates were condemned as being responsible for the irregular working, and this belief caused a hopeless discouragement to take possession of my principle men, unfitting them for effective work, notwithstanding all the records I was able to show to the contrary. They could not or would not be convinced.

On one occasion an opportunity occurred to prove conclusively that bosh plates were innocent of all blame. Following an unusual large cast of iron, as on previous occasions, the dirt accumulation loosened and moved down to the tuyeres so that the furnace would not take any blast. Instead of attempting to force blast into the furnace and thus closing the tuyeres with semi-fused iron and slag, the engine was stopped and several tuyeres removed before the dirt was fused into a sticky mass. Bars and hoes were used to remove the stock. In a short time we were almost overwhelmed with a flow of red hot dirt flowing like so much red hot pewter sand. This was removed and the ravelling continued until the lower part of the furnace was completely emptied, but there was no movement of the stock on top of the furnace. Dynamite cartridges were used above and below to cause settling, but with no effect.

The men were cautioned to keep away from the tuyere openings, for fear of accident in case the stock should drop suddenly and drive out a volume of burning gas. No movement occurring, my foreman and myself cautiously approached a tuyere opening and, reaching forward, looked up into the shaft of the furnace. The boshes were found to be perfectly clean and in beautiful shape. The bosh plates were seen to have nothing whatever to do with the trouble, as an arch had formed fully 15 feet above the top row of plates. The skew back of this arch was later located more exactly by drilling holes through the brickwork. Had this arch given way while we were at the tuyeres openings we would have been cremated.

The tuyeres were replaced and the engine started. Gas issued from the top of the furnace. The blast pressure was low. This gradually increased, becoming quite high and the flow of gas almost ceased again. Conditions assumed a serious aspect, for unless this arch broke away, the blast was ended. Gradually the pressure lightened, showing that the blast was making its way through the arch, and finally, with a terrible roaring noise, the stock settled or jumped, making a pyrotechnic display that would have been interesting under more favorable auspices. Red-hot coke, in large quantities, was driven out of the top of the furnace (the bell fortunately being open), down through the gas flues and up through the stove checker work and chimneys, for many feet into the air. This occurred about midnight. The scene for a minute or two, with the mass of fire and gas, was calculated to cause dismay, if we had had time to think. Fortunately no one was injured. The furnace resumed working and commenced to melt regularly. In the course of a few days, after more or less trouble with a high bottom and chilled tapping hole, necessitating the use of the oil blow pipe, the furnace was in normal working condition.

After this we did not take any more chances. All were convinced that the bosh plates were not the cause of the irregular working, and with renewed courage we went to work to combat our old enemy with the confidence born of many victories. If we could not prevent the dirt accumulating, by carefully watching the symptoms, we could prevent serious consequences following. So far the present blast commencing December, 1896, has been free from any serious troubles of the kind, but only for the reason that we are constantly on the watch and do not permit the slightest symptoms of disorder to pass unnoticed. We are now making 1,200 to 1,400 tons of iron per week—the total product for 1897 being 63,137 tons—as compared with 17,148 tons for 1878.

Careful, experienced and intelligent nursing is just as important in the modern furnace as in the modern hospital.

Chicago Iron and Steel Works Rumors.

Various reports have been sent out from Chicago concerning the tract of land at East Chicago, Ind., on the lake front recently purchased as an investmenit by Chicago and Pittsburg men, H. C. Frick being included among the latter. It is hardly necessary to say that the purchase does not mean the building of Chicago works by the Carnegie Steel Co., or any connected company, Mr. Frick's interest being acquired on his individual account. The report of the breaking of ground for a cast iron pipe foundry last week was erroneous. No such plant is in contemplation by the purchasers of the tract. The only work being done is in the building of a harbor, as it is the expectation that the land will be used ultimately for manufacturing sites, several firms having already begun negotiations. The rumors connecting the new Titan Steel Co., of Chicago, with this tract and referring to co-operation between the new company and the Illinois Steel Co., are without foundation. There is no large German syndicate in the enterprise, so far as can be learned, nor is the Titan Steel Co. the nucleus for a large company on any such scale as that of the Illinois Steel Co. The new company will make products in different lines from those of the big Chicago company. Its plans are not fully developed as yet, nor are the incorporators, so far as can be learned, persons who will be actively identified with its operations.

Connellsville Coke Production.

Estimates of Connellsville coke shipments in the first half of 1898 give a total of 4,158,961 tons—2,140,013 tons for the first quarter of the year and 2,018,948 for the second quarter. Production in the half year ranged from 136,000 to 156,000 tons a week, being above 150,000 tons until the second week of May, and since that time between 136,000 and 146,000 tons, the blowing out of valley blast furnaces being responsible for the curtailment. The price of furnace coke has hovered about $1.50 for the standard Connellsville product, though some producers have shaded this figure. For foundry coke the market has been $1.80 and $1.85. If the estimates of weekly production made through the first half of the year are correct, the output for 1898 is likely to fall somewhat below 8,000,000 tons, in view of the lower production of pig iron in the past two months and the probability that the average production of Connellsville coke in the four months ending with August will not run much above a 7,000,000-ton rate. In the week ending July 23, with 13,293 ovens reported active, the output was estimated at 138,562 tons, compared with 137,067 tons in the preceding week.

At the Stockholm meeting of the Iron and Steel Institute, on Aug. 26 and 27, the following papers are to be read: 1. "The Development of the Swedish Iron Industry," by Richard Akerman. 2. "The Most Prominent and Characteristic Features of Swedish Iron Ore Mining," by Professor G. Nordenstrom, School of Mines, Stockholm. 3. "The Danger of Using Too Hard Rails," by C. P. Sandberg. 4. "The Action of Explosives on the Tubes of Steel Guns," by Prof. W. C. Roberts-Austen. 5. "Brittleness in Steel Produced by Annealing," by J. E. Stead, Middlesbrough. 6. "The Micro-Chemistry of Cementation," by Prof. J. O. Arnold, University College, Sheffield. 7. "The Influence of Metalloids on Cast Iron," by Guy R. Johnson, Embreville, Tenn.

The Grant Ball Co., of Cleveland, whose affairs are in the hands of a trustee, has not been operating on a large scale pending reorganization. The company manufactures steel balls up to four inches diameter, and machinery for ball manufacture. Its products include also bicycle parts, lawn mower parts, axles, and bearings for vehicles and machinery. Orders have been received from many foreign countries, and when operations are resumed in full it is the expectation that special attention will be paid to foreign business. The plans for the future include the manufacture of engine lathes, mill ing machines and a general line of machine tools.

The spur track of the Southern Railway, from Leeds, Ala., to the brown ore beds of the Sloss Iron & Steel Co., has been completed and the shipping of ore will begin at once. An ore-washing plant has been installed. This ore is richer than that of other deposits and will insure a reduction of 30 to 40 cents a ton in pig iron cost.

MICRO-STRUCTURE OF IRON AND STEEL.*—II.

BY S. S. KNIGHT.

Another of the compounds of iron and carbon has long been known as pearlyte, on account of its nacreous luster. When viewed with upward of 500 diameters of magnifying power, under vertical illumination this constituent may be resolved into flakes of a hard and soft material lying in alternating lamillae or strata. Formerly this substance was divided into two kinds, known as granular and lamilar pearlyte. This terminology has entirely disappeared, and in its place has come the word sorbite, in honor of Dr. Sorby, who, as will be remembered, was spoken of as the founder of this science. It has been clearly demonstrated that this sorbite is not of the formula Fe_3C, as originally supposed, since when etch polished, the color changes from yellow to light brown and then from blue to purple, and at no time as the change goes on is the color homogeneous. It has been suggested, and with reason, that this constituent may have the formula $Fe_{10}C$.

Still another compound, which is of recent discovery, is termed Martensite, after the noted German microscopist, Prof. Martens. It is always present in iron that has been quenched from above the point of recaloresence, and requires etch polishing to bring out the structure, which is usually seen in the from of faccicles or collections of parallel rectilinear fibers. The matrix in which these fibers lie may be ferrite, containing a small amount of emulsified carbide of iron of uncertain composition or may appear to be intersected by short irregular lines. Osmond believes that what is now called martensite is not a definite compound of carbon and iron but rather an allotropic form of iron in crystalline arrangement, under the influence of carbon. This theory seems, however, strained to suit the one proposed by the same author in regard to the retardation in heating or cooling high carbon steels. This theory of crystalline arrangement finds some evidence in its support, from the fact that martensite is often seen as groups of fibers in bundles of three, running parallel with the sides of a triangle, as is the case in bodies which crystallize in the cubical system. Martensite may not always be identified by etch polishing, as sometimes it is not colored and then it takes but a light yellow sheen. Tincture of iodine causes it to take a yellow, light brown or black color, according to the carbon content of the steel being examined. It is partly on account of this irregular manner of receiving color that it is disputed whether it is a fundamental compound or not.

*Read at the Cincinnati meeting (June, 1898,) of the American Foundrymen's Association.

The last, and in many cases the least known of all the microscopic constituents of steel is troostite, socalled in honor of the noted French microscopist, Dr. Troost. This compound may be found in properly quenched medium iron, and if etch polished, nodules appear in relief together with strips or orientations of ferrite, while between these may be seen intercalations of moderate hardness and varying depth. These bands show temper colorations which produce an irregular spotted apperance not unlike the surface of a spotted marble. The strangest characteristic of this constituent is that it is almost amorphous, and sometimes slightly granular but never stratified.

Coming back to the peculiar behavior of steels and the facts that have been discovered in observing their deportment under various conditions. The peculiarity of recaloresence we have considered, the other of which mention was made is now before us.

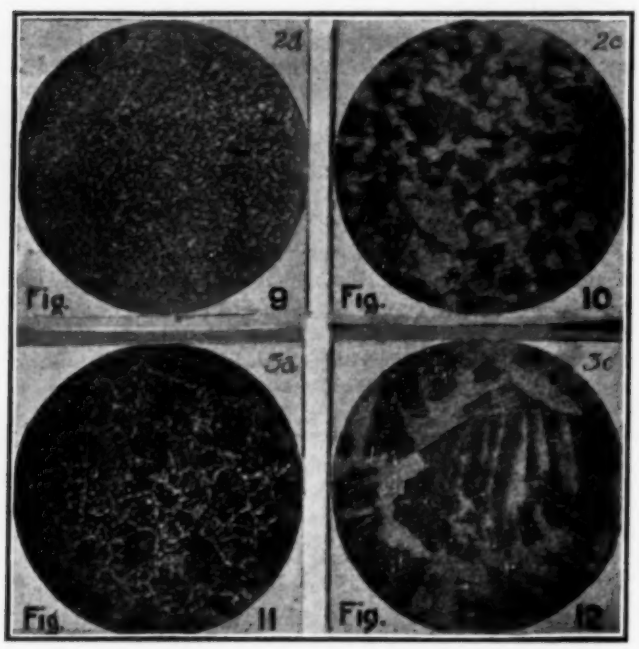
The art of tempering steel has been known for centuries, but the nature of this process has not until recently been demonstrated. The fact that a bar of steel can be heated and cooled and by this process have its physical characteristics changed without altering its chemical composition seems in itself to be strong evidence that a change of no mean dimensions must have taken place in its structure. Before the utilization of the compound microscope it was impossible to obtain any definite knowledge concerning this change, but its use, supplemented by careful chemical analysis, has done much to unravel this mystery. It was fomerly supposed that when a piece of tool steel was heated above moderate redness and quenched, that the sudden cooling in some manner made the molecules of iron come into closer contact, and hence so greatly augmented its density. This theory was, however, ridiculous since the volume of any material thus treated was also increased. Microscopic examination showed that the real cause of hardness was the formation of a subcarbide of iron of the probable formula $Fe_{24}C$. This compound decomposes in the presence of the most dilute acids into the normal carbide of iron and pure iron which appears under the microscope as ferrite. This subcarbite of iron possesses almost diamond-like hardness and also a great capacity for permanent magnetism. Its decomposition may be affected by annealing, and in such cases it is to be remembered that the temperature need not be higher than moderate redness, as it has been found that this carbide is decomposed by temperature of as low as 400 degrees C. It is readily seen, from the above facts, how quenching may harden and annealing soften any steel which has a high carbon content.

FIG. 9.
Series II, 2a—Annealed at 750°C; Vertical Ill. x 30; Carbon, .45%.

FIG. 10.
Series II, 2c—Annealed at 750° C; Vertical Ill. x 200; Carbon, 45%.

FIG. 13.
Series II, 1a—Hammered; Vertical Ill. x 30; Carbon, .45%.

FIG. 14.
Series II, 1c—Hammered; Vertical Ill. x 200; Carbon, .45%.



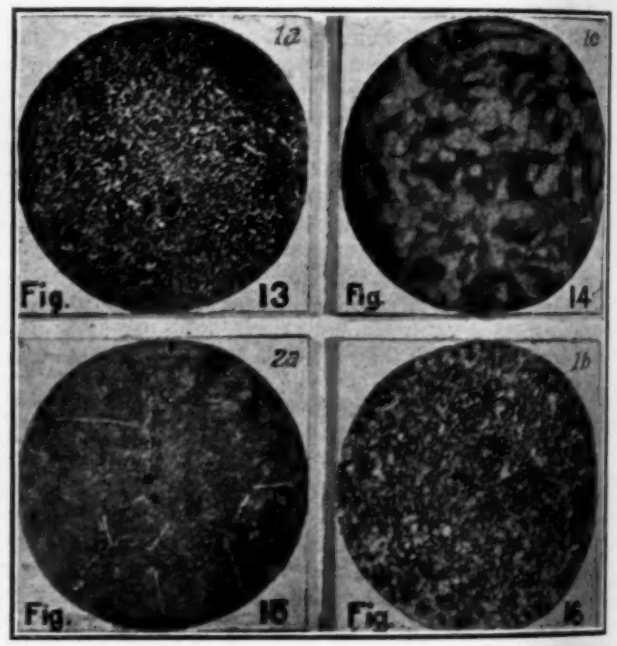


FIG. 11.
Series II, 3a—Annealed at 1115° C; Vertical Ill. x 30; Carbon, 45%.

FIG. 12.
Series II, 3c—Annealed at 1115°; Vertical Ill. x 30; Carbon, 45%.

FIG. 15.
Series III, 2a—Annealed at 1330° C; Vertical Ill. x 33; Carbon, 1.24%. (Light piping ferrette; 1330°C; Burnt Steel.)

FIG. 16.
Series III, 1b—Hammered; Oblique Ill. x 33; Carbon, 1.24%.

Following this same phenomenon a little further, the above facts also constitute an explanation of why heating to dull redness will invariably destroy any permanent mangnetism which a steel may possess. It is only necessary to keep in mind the capacitiy this carbide has for permanent magnetism and its low temperature of decomposition in order to have in hand all of the causes which are operative in bringing about this seemingly strange result.

While considering this form of carbon and iron combination, it will be apropos to spend a moment on another phenomenon commonly known as case-hardening. This process has been indiscriminately called a carbonizing or a phosphorizing one, according to whether the material to be case-hardened was packed in charcoal or bone-meal. As is well known, the depth or extent of this surface hardening is in proportion to the amount of time that the incandescent material is kept in contact with the packing, and also varies with the kind of filling used. The fact that is most worthy of our attention is that no hardening takes place until the material is quenched, and the higher the temperature at which this quenching occures the harder will be the material thus treated. In order to determine if this process consisted in phosphorizing or carbonizing the stock, a bar of low carbon steel was cut into two pieces, one being retained as found and the other heated with the packing along with other work, being case-hardened for three successive days. At the expiration of this time a sample of each piece was taken into the laboratory, and analyzed for carbon and phosphorus. The analysis showed the following results:

	Original Stock.	After being Case-hardened.
Phosphorus,	.006 per cent.	.006 per cent.
Carbon,	.0768 per cent.	.225 per cent.

FIG. 17.

Series III, 2b—Annealed at 1330° C; Oblique Ill. x33; Carbon 1.24%. (1b and 2b—extreme variations due to heat; light ferrite.)

FIG. 18.

Series III, 1a—Hammered; Vertical Ill. x33; Carbon 1. 24%.

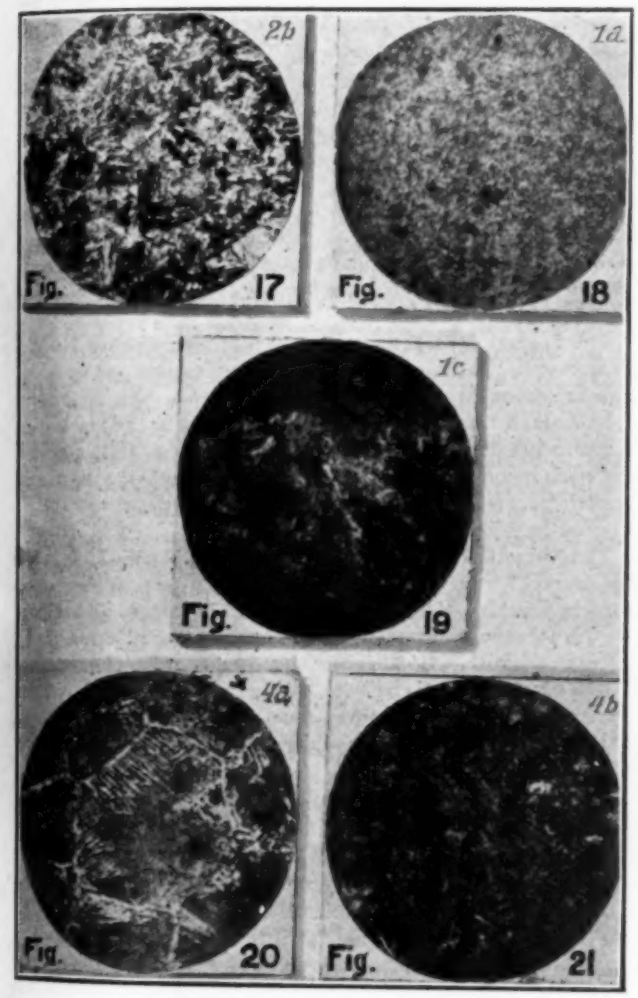


FIG. 19.

Series III, 1c—Hammered; Vertical Ill. x225; Carbon 1.24%.

FIG. 20.

Series II, 4a—Annealed at 1030° C; Vertical Ill. x 30; Carbon, 45%.

FIG. 21.

Series II, 4b—Annealed at 1330° C; Oblique Ill. x 30; Carbon, .45%

In the original stock this carbon proved to be in the form of the ordinary carbide of iron (Fe_3C), both from microscopic and chemical tests. The case hardened piece was then heated and quenched until it was so hard that a file could scarcely cut it. An examination was made to ascertain in what state the carbon now existed and again both microscopic and chemical tests were made, with the result of proving beyond a doubt that the carbon had changed from the ordinary carbide form into the almost diamond-hard subcarbide of iron of the formula $Fe_{24}C$.

As mentioned before, one of the greatest advantages of using this system of microscopic investigation is the certainty with which the manner of working the stock may be told. Thus a sample of the steel rod which was spoken of could be sent to any part of the world and the microscopist making the examination would know that A had been subjected to a temperature suitable for the working of stock carrying .34 per cent carbon, and that B had been heated to a temperature far in excess of this safe limit, and was no longer suited to the purposes for which A could be used.

While speaking of the manner of inspection which may be done with this instrument, some photomicrographs of steel of different carbon content will show how much of value may be learned by means of the microscope. No. 9 shows a sample of .45 per cent carbon steel annealed to a temperature of 750 degrees C. magnified only a small amount under vertical illumination. The granular appearance is at be noted as it disappears under a higher magnification. No. 10 shows this same specimen magnified 66 times more than No. 9. The ferrite now appears in large irregular flakes not so uniformly distributed as would be inferred from No. 9. Another sample of this same steel is shown in No. 11, this time the annealing having taken place from a higher temperature, 1115 degrees C. In this case the ferrite is seen as ramified needles lying at all angles to each other. No. 12 is the same specimen under a magnification 66 times greater, the ferrite again appearing in irregular flakes. Nos. 13 and 14 are specimens of the same steel which have been subjected to treatment under the hammer, the ferrite showing as in the previous illustrations.

Coming now to heat treatment, we see in No. 15 a sample of tool steel containing 1.24 per cent carbon, which has been annealed at the high temperature of 1,330 degrees C. This steel shows the effect of this burning in the light piping ferrite, which is an infallible sign in any steel that it has been subjected to too high a temperature.

No. 16 is another sample of this high carbon, this specimen being hammered. It is shown in oblique illuminations, the ferrite appearing as light flakes. No. 17 shows the other extreme of temperature for this same stock, it having been annealed at 1,330 degrees C. Here the ferrite again assumes its characteristic appearance in burnt steels, the illumination being also oblique.

We now come to No. 18, a sample of the same stock having been hammered. The ferrite seems to be more finely divided and this conclusion is substantiated by the same specimen as seen under a magnification 66 times as great as shown in No. 19. Here the ferrite appears as a cloud and this structure always indicates a strong and uniform steel.

No. 20 shows a sample of steel containing .45 per cent of carbon which has been subjected to a temperature too great for working. The ramifications of the ferrite are beautifully shown under vertical illumination, while in oblique illumination the structure appears less certain, No. 21.

Coming back to heat treatment, and its effects upon steel in general, there is no more remarkable discovery that has been made in this field for many years than the explanation of the phenomenon of water-annealing. This heretofore inexplicable process is now accounted for in the most common place manner by means of the facts recently found out by the microscopic examination of iron.

If the end of a bar of iron be heated to a light redness and quenched in water, while the other end be left cold, it will be found that there is a place along the bar where the hardness is less than it was before the heating, although the end most highly heated be so hard that a file cannot cut it. It is now known that the increased hardness is imparted to the steel by the changing of the normal carbide of iron to the sub-carbide. This sub-carbide existed in small quantity in an emul-

sified form in the original bar, thus giving it what hardness it possessed. Now, as this sub-carbide decomposes at so low a temperature there is a place in the bar where what little sub-carbide did originally exist, is changed into the normal carbide and thus the determination of that portion which will be water annealed. As the temperature rises this normal carbide would be transformed into the sub-carbide, but as this rise at this point never takes place, the carbon is left in this intermediate form.

The use of the microscope in cast iron work will not be as easily demonstrated as in the case of steel, for in this field we have to deal with more fundamental forms, both of crystallization and chemical composition. The presence of one of these, graphitic carbon, greatly complicates the process and renders the microscopic examination of cast iron far from easy for the beginner. This in no way lessens or modifies the value to be received from its use but renders the possibility of its becoming popular less certain.

Possibly no character of work could afford a better example of the value of the adaption of microscopic metallography to foundry work than a brief description of its use in the manufacture of the so-called gun-iron. As is well known, the only requirement of this metal is its high tensile strength, which should be over 30,000 pounds per square inch. Thinking that some other data would be of interest, a few other measurements have been made, which will be seen to be quite nearly allied to similar tests made upon the common iron used daily for ordinary castings. These bars were pulled and broken without any finishing of any kind, except Nos. 1 and 2, which were accurately turned down to size, the others being taken from the mold and rattled to clean off any adhering sand.

	Tensile Tests.		Transverse Tests.				
No.	Meas'm'ts.	Brk. Str.	Meas'm'ts.	Def.	Sh'kg.	Brk. Str.	H'd'ns.
1	Area 1 sq. in.	34,700	.563x.563"	.100"	.140"	1,500	237°
2	Area 1 sq. in.	35,400	.564x.563"	.080"	.145"	1,490	236°
3	Area 1 sq. in.	33,770	Shrinkage was measured on 1 lineal foot.				
4	Area 1 sq. in.	32,430	Deflection was taken at 1,000 pounds.				

These bars show a shrinkage slightly in excess of that ordinarily seen in cast iron and a hardness slightly above that of material suited for common machine work. Bars No. 1 and No. 2 were pulled on an Olsen machine, while all other tests were made upon a Riehle machine except the hardness determinations, which were made upon Mr. Bauer's hardness tester.

In explanation of these results it must be remembered that all such metal is made of a small percentage of steel scrap, and that this material is low in carbon as compared with cast iron. But it must not be inferred that the consequent reduction of the carbon content, due to the addition of the steel accounts for the increased strength, for such is not the case. The combined carbon of cast iron does not exist in the same form as that which is found in the steel. Thus the carbon that exists as normal carbide of iron in pig iron, which is both soft and weak, when melted with steel or light cast iron scrap in a cupola where the metal comes into contact with the incandescent fuel, will be changed into one of the more complex forms of iron carbide, and may be identified as such under the microscope. It will thus be seen that in order to have an iron of exceptional tenacity it is only necessary to have a certain amount of these higher carbides of iron present, providing that the analysis of the metal is somewhat similar to the following:

Silicon, ...75 per cent to 1.00 per cent.
Sulphur, ...030 per cent to .07 per cent.
Phosphorus, ...250 per cent to .300 per cent.
Manganese, ...400 per cent.
Combined carbon, ...750 per cent.
Graphitic carbon, ... 2.000 per cent.

If for any reason an iron should have such an analysis and yet not have the desired strength it is only necessary to examine it and see if the higher carbides of iron may be seen, and if so whether they appear to be uniformly distributed throughout the mass. If not the mixer of such metal should at once take steps to bring about the increase in these carbides, which may be done in a number of ways.

And so examples might be brought ad infinitum showing the benefit which may be derived from the use of the microscope in the hands of a competant man. Want of time prohibits our going further into the investigation of this science at this time. The subject has necessarily been tedious to all who have not had at some time an opportunity to see for themselves the vast field which is open to study and improvement through the use of this instrument. However, it affords delight to me to be able to say that so much advancement has been made in such a comparatively short time. The science has an unlimited field before it, and it only remains to be seen how much benefit will be derived from its use in the future. It has been of this much value already that by its use we have been placed in possession of facts which explain phenomena which before appeared apparently without cause.

All photomicrographs are from reprints of those made by M. Frances Osmond, of Paris, France.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:--

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until 2 P. M., Aug. 11, for removing the old and constructing new heating apparatus for the U. S. Court House and Postoffice building at Knoxville, Tenn. A similar contract for Lincoln, Neb., will be let Aug. 15.

The Gisholt Machine Co., of Madison, Wis., has outgrown its present plant and is about to erect a new factory. The location has not yet been fully decided upon, the company now being in correspondence with organizations and individuals in various cities that are desious of getting new industries located with them.

The Corbett Mill Supply Co., 487 Missouri ave., N. W., Washington, D. C., will buy a gasoline engine of 15 h. p., new or second-hand.

Shoneman Bros., 8th st., Philadelphia, are in the market for a return-tubular steel (dry pipe) boiler, 66x16 feet, good for 125 pounds of steam; also Corliss engine of 150 h. p. and electric generator (110 volts) to carry 150 h. p.; second-hand, in good running condition.

The Norwalk Foundry & Machine Co., of Norwalk, O., is in the market for an extra length galvanized iron folder, rolls, turning machine, double seamer stake with heads and soldering furnaces, with good heating capacity, suitable for heavy galvanized work. Good second-hand tools are preferred.

The Chadborn & Harris Co., of Newburgh, N. Y., has been incorporated to manufacture brass articles. Capital, $3,000. Directors, Frederic C. Chadborn, of Newburgh, and two others.

A new foundry will be built at Belleville, Ill., by E. P. Rogers and Geo. McC. Rogers, proprietors of Excelsior foundry. Additional land has been purchased.

The Kentucky Stay Wire Fence Co., of Nicholasville, Ky., has been incorporated; capital, $10,000. J. D. Hughes and Charles Deering are among the promoters.

New Construction:—

Work has begun on the plant of the Fort Pitt Bronze Co., Pittsburg, between the Pennsylvania Car Wheel Works and Edith Furnace. The principal building will be 70x150 feet. Wm. B. Scaife & Sons have the contract. The new company's president is J. W. Rhodes; treasurer, L. W. Young, and secretary E. B. Hukill.

New machine shops for the Green Bay & Western Road are going up at Green Bay, Wis.

At Chattanooga, Tenn., the Milburn Wagon Co., whose plant was recently destroyed by fire, is making arrangements to rebuild.

The rebuilding proposition of the Burgess Steel & Iron Co., Portsmouth, O., involves the sale of 400 building lots on Damarin Hill, east of the city. The company agrees to erect three buildings 300 feet wide and 750, 900 and 600 feet long, respectively, giving 50 per cent more capacity than the old plant.

The new plant of the Slaymaker-Barry Co., at Connellsville, Pa., will be of iron and steel, and will cost $20,000. The main building will be 70x400 feet. Besides this there will be a boiler room 35x42 feet, an engine room 36x40 feet, and a

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The Fall River Bleachery, at Fall River, Mass., has placed the contract for its new mill with the Berlin Iron Bridge Co., of East Berlin, Conn. The building is 65 feet wide and 200 feet long with side walls of stone. The supporting frame work is of steel.

stock house 20x40 feet. The contract has been let to Edw. Erickson, contracting engineer of Pittsburg. Mr. Erickson also has secured the contract for putting in two new mills at the plant of the Humbert Tin Plate Co., at Connellsville.

The Shenango Valley Steel Co., New Castle, Pa., is making rapid progress with the erection of its 30-mill tin plate plant. The mill building and the cold rolling building are under cover, and the foundations are down for the 30 hot mills. Work will be started shortly on the tin house, which will be over 800 feet long.

The Riter-Conley Co., Pittsburg, has been awarded the contract for constructing the largest natural gas holder in the country for the Allegheny Heating Co., at a cost of $225,000. The holder will contain 5,000,000 cubic feet of natural gas and will insure Allegheny residents a steady flow of fuel during winter. It will be the highest holder, except one in New York, in the country. The tank proper, which will be of heavy steel, will be 44 feet high, and the holder will rise 177 feet higher, making the total height 221 feet. It will be 198 feet in diameter, will contain over 3,000 tons of steel and will have many new features. It will probably be one year in building.

At Lynchburg, Va., P. C. Hubbard will rebuild at once his reburned plant. The machine shop will be 40x100 feet, with wing for smith shop, and separate building 20x30 feet, for patterns.

Work will begin at once at Newport News, Va., on the dry dock of the Newport News Ship Building & Dry Dock Co. The dock will be 800 feet long, with breadth of 80 feet at bottom and 148 feet at the top; depth will be 41 feet 8 inches from the top of the sill, thus giving 34¼ feet of water at low tide; the keel blocks will extend five feet above the bottom, enabling a vessel drawing 29¼ feet of water to enter.

Vinton & Co., Detroit, will build a foundry 120x65 feet on Beaufait ave.

Additions, Enlargements, Removals, Etc.:—

It is reported that the Common Sense Corn Planter Co., of Muncie, Ind., will remove to Ottumwa, Ia. The company employes 200 men.

At Chattanooga, Tenn., the Ross-Mehan Foundry Co. is erecting another foundry addition, 50x100 feet.

The Midland Steel Co., Muncie, Ind., increased the capital stock of the company to $500,000 at a recent stockholder's meeting, and will make extensive additions to the works, on several acres of ground just purchased.

The Springfield Machine Tool Co., Springfield, O., will have much needed addition to its machine shop capacity when the new foundry 60x175 feet with two wings is completed. The old foundry will then be available. The employes are now working 10¼ hours a day. The works are four months behind orders. Two good orders were received last week from London and Stockholm.

The new building the Nolte Brass Works are erecting at Springfield, O., is well under way. It will add much to the capacity of the plant.

At Quincy, Ill., the Gem City Foundry is building an addition.

The Dillon-Griswold Wire Co., Sterling, Ill., is reported to be planning the erection of a rod mill.

Great Northern shops at St. Paul, are to be greatly enlarged at once, and several hundred thousand dollars spent, conditioned on vacation of certain streets by the city.

The Leechburg Foundry & Machine Co., of Leechburg, Armstrong county, Pa., will remove its plant to Homestead. A deal was closed last week for 31 acres of land half a mile below Homestead, at about $130,000, the site having river front and connection with four railroads. Six acres have been sold to the Shiffler Bridge Co. The latter company has

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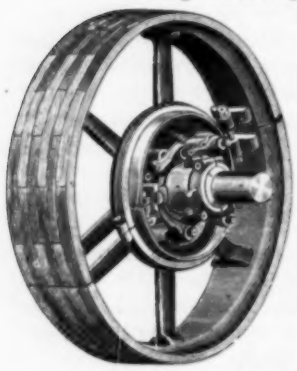

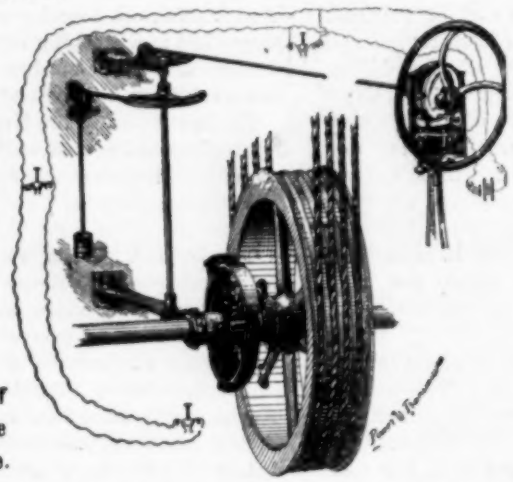

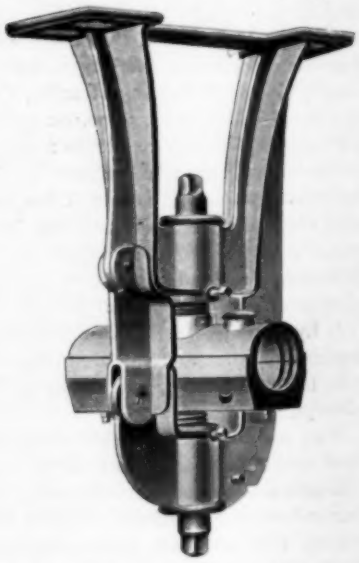

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not decided on its plans and does not contemplate immediate removal. The Leechburg Foundry & Machine Co. will double its capacity at the new site and expects to begin work some time in August. It is expected that $250,000 will be expended on the new plant and that in addition to the equipment in the Leechburg work, much new machinery will be purchased. Fully 300 men will be employed.

The Brooks Locomotive Works, Dunkirk, N. Y., has awarded a contract for an addition to its boiler shops to the Buffalo Bridge & Iron Works, also to remodel the present shop. The addition will be 220 feet long, 80 feet wide, and 36 feet high. The entire length of the roof will be traversed by a 10-ton crane. The old building will be thoroughly remodeled, and when completed, will be 230 feet long, 78 feet wide, and 45 feet high. Along the roof of this building a 25-ton crane will run.

Fires and Accidents:—

A portion of the Fairbanks, Morse & Co. plant, at Beloit, Wis., burned July 27; loss $20,000, insured.

An engine break-down at the Central Iron Works, Harrisburg, Pa., will cause a shut-down in one department for some time.

At Wawaset, Pa., the fence factory of P. Wilkinson burned, with machinery and stock.

General Industrial Notes:—

Lawrence Furnace, at Lawrence, near Ironton, O., blew in last week. The product is high-silicon iron.

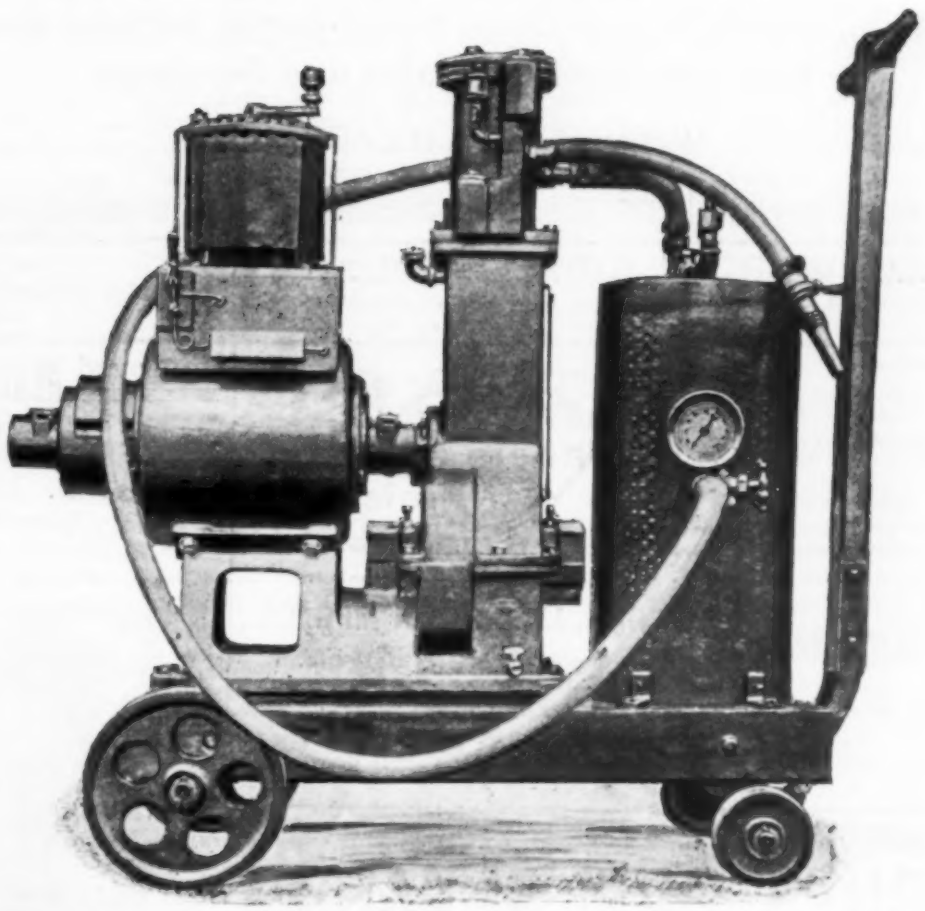
At the Belfont Iron Works, Ironton, O., work is going on preparatory to installing wire nail machines. At present only cut nails are manufactured.

The American Tube & Iron Works, made a shipment from

U. BAIRD MACHINERY CO.

ALL KINDS OF

MACHINE TOOLS.



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SHENANGO VALLEY STEEL CO., New Castle, Pa.,

MANUFACTURERS OF

Bessemer Pig Iron, Steel Billets, Blooms. Black Plate, Tin Plate, Tin Plate Bars, Wire Rods, Market Wire and Wire Nails.

Middeltown, Pa., recently, of 15 car loads of 10-inch pipe to South Africa. Shipments are constantly being made to London, Barbodoes, West Indies and Holland.

Striking employes of the tube works department of the Longmead Iron Co., Conshohocken, Pa , returned to work at old wages.

Citizens of Bucyrus, O., through their board of trade are arranging to purchase the old plant of the Bucyrus Steam Shovel & Dredge Co. there and give it to the Turner Engineering Co., which now occupies the buildings. This its the outcome of rivalry between Marion and Bucyrus.

The receivers of the Bass Foundry & Machine Works, Ft. Wayne, Ind., have transferred the property of the company to the Bass Foundry & Machine Co. The new company will also come into possession of the Rock Run Mining Co., and the Lenoir Foundry Co., of Alabama. It will have a capital stock of $2,000,000 and will issue bonds to secure the indebtedness of $1,000,000, due the mortgage creditors of the old company. All other creditors will be paid in full.

The strike at the Anderson Bolt Works, Anderson, Ind., has been settled.

The first of 50 10-inch guns for the Government is now being built at the Diamond Drill & Machine Works, at Birdsboro, Pa. The guns will be 30 tons each.

The picnic given by the Brooks Locomotive Works, Dunkirk, N Y., celebrating the completion of the 3,000th locomotive was attended by about 3,000 people.

The Pioneer Mining & Mfg. Co will blow in one of its idle furnaces at Thomas, Ga., early in August. It has been idle nearly a year.

The Detroit Steel & Spring Co.'s plant is running 24 hours a day, having more work than at any time in its history. The steel foundry is also fully occupied. Three 200 h. p. waste heat boilers were installed recently.

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Regenerative Gas Furnaces and Water Seal Gas Producers.

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The A B C of Iron, Now $1.

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SEMI-STEEL

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(Cupola metal.) Government tests 36,000 to 49,000 tens. strength.

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OF ALL KINDS

MANUFACTURED BY

The Long & Allstatter Co.,

HAMILTON, OHIO.

Send for catalogue.

The Union Iron Works Co., Buffalo, N. Y., expects to start up its new furnace early in September.

The Shaw Electric Crane Co., of Muskegon, Mich., recently shipped a 50-ton ladle crane to the Nicopol Mariopol Mining & Metallurgical Co., Mariopol, Russia. This is a duplicate of the four sent in 1896.

The Mahoning Valley Iron Co., Youngstown, O., has blown out Hannah Furnace, and the work of overhauling and making improvements has begun. The company will put in a battery of new Stirling boilers, 1,000 h. p., and make other important improvements.

The Kilmer Mfg. Co.'s wire nail plant at Newburgh, N. Y., is being put in shape to resume operations.

Newspaper reports indicate that the Southern Iron Co.'s charcoal furnace, at Attalla, Ala., will soon resume.

Elk Rapids Furnace, at Elk Rapids, Mich., blew in July 27, after a shut down of over three months for repairs. The chemical works were in operation two weeks before.

The rod mill of the American Steel & Wire Co., at Anderson, Ind., has resumed, the scale trouble being settled. The wire drawers are still out, however. The company intimates that if the proposed scale which is the one operative at its other plants, is not soon accepted, these departments will be closed and the work transferred to other cities.

The new rod mill at Joliet is of the Morgan continuous type. It is about ready to start. Hoops and cotton ties will be the final form of much of the product.

An old furnace at Edge Hill, Mongtomery co., Pa., with 23 buildings and 123 acres of land was sold last week to the National Bank of the Republic for $45,000. Edge Hill is on the North Penn Road and was a prosperous village until the furnace closed down.

The blast furnace and wash metal plant of the Youngstown Steel Co. will close down this week and will not resume work until September.

Struthers Furnace, Struthers, O., has been banked for repairs.

The Carnegie Steel Co. made its sixth shipment of rails and track material for the Trans-Siberian Railway from Pittsburg last week. There were 3,743 tons of steel rails—besides fish plates, etc.

The Pittsburg Locomotive Works has just received the contract from the Chicago & Eastern Illinois Railroad for seven large consolidated locomotives.

About 60 negroes, brought from Birmingham, Ala., have been put in place of the striking furnace employes of the Illinois Steel Co., at South Chicago. Iron carriers and helpers were still out last week. They receive $2.10 a day. They asked that a larger number of men be employed.

Baltimore papers say that the Maryland Steel Co., Sparrow's Point, and the Columbian Iron Works, Locust Point, are likely to bid on the new vessels recently authorized by Congress.

The Cumberland Nail & Iron Co., Bridgeton, N. J., went into receiver's hands July 26. The capital stock is $500,000 and there was heavy bonded indebtedness, mortgages amounting to $175,000. Robt. F. Buck, president and Chester J. Buck, vice-president, held most of the stock.

The Knoxville Iron Co., Knoxville, Tenn., held its annual meeting July 26. Reports showed better business than for several years. The directors elected are: E. J. Sanford, W. P. Chamberlain, W. S. Mead, W. R. Tuttle, and Thos. Stevenson, of this city; H. S. Chamberlain, of Chattanooga, and W. H. Van Benschoten, of New York.

The Totten & Hogg Iron & Steel Foundry Co., Pittsburg, rolling mill engines, rolling mill and tin mill machinery, has just received an order to equip the new annealing furnaces of the Monongahela Tin Plate Co., Pittsburg, with the Freeman patent furnace charger.

James Bowron, vice-president and treasurer of the Tennessee Coal, Iron & Railroad Co., commenting on the trip of Illinois Steel Co. and American Steel & Wire Co. officials to Birmingham, is quoted by a local newspaper to the effect that propositions have been considered and made by the Chicago people with a view to building a rod mill at Ensley City. It is Mr. Bowron's belief that by the time the steel plant is completed there will be other plants located that will take all its output. A Chicago dispatch says that while the price for steel named by the Birmingham company is not satisfactory, there is strong probability of a rod mill going up, if the price of steel is made low enough.

Within the past 60 days the S. Obermayer Co., of Cincinnati and Chicago, has made the following sales of Whiting cupolas: One each to Webster Mfg. Co., Chicago, No. 7; William Ferguson Foundry Co., Chicago, No. 6; Indianapolis Foundry Co., Indianapolis, No. 5; C. H. Dutton, Kalamazoo Mich., No. 3½; National Sewing Machine Co., Belvidere, Ill. No. 5; Deere & Mansur Co., Moline, Ill., No. 3; Moser Wehrle & Co., Newark, O., No. 7; University of Nebraska, Lincoln, Neb., No. 1. The above list would indicate a better outlook in the foundry trade. The S. Obermayer Co. is in a position to outfit foundries completely, with late and improved designs of equipment and supplies. The company has lately issued a new catalogue and will send a copy to any foundryman desiring it.

The Diamond Machine Co., of Providence, R. I., in addition to its large line of grinding machinery, manufactures many special machines, both from its own designs and from drawings of customers. This company made the machines on which the now well known "Christy" bread knives were ground automatically and it has just finished a machine for grinding a new patented bread knife on a somewhat different principle from the Christy.

The Government work taken by the Morgan Engineering Co., Alliance, O., has considerably increased the force Over 700 men are employed and 100 more are wanted. Recent extensions to capacity include an erecting room 200x60 feet and a forge plant 120x50.

J. A. Rodgers, who has been connected with Russia iron manufacturers, is negotiating with the Cumberland, Md., board of trade, to start a plant there. Demonstrations have been made at the plant of the Cumberland Steel & Tin Plate Co.

The E. P. Allis Co., Milwaukee, has secured the contract for the machinery of the new Franklin mill, at Houghton, Mich., to include five stamps, and a 15,000,000 gallon pump. The mill building will be of steel, and is to be ready July 1, 1899. The Allis company took machinery orders amounting to over $100,000 in Houghton county in 10 days recently.

Thomas Furnace, at Niles, O., banked this week and will remain idle until September.

The report that the Wisconsin Steel Co. (Rockefeller), would start up its plant at Superior, Wis., is denied. The pipe works of the company will continue for some months as heretofore.

EDWIN HARRINGTON, SON & CO., Inc.,

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Designers and Manufacturers of MODERN MACHINE TOOLS.

EXTENSION LATHES: Strong, Handy, Powerful. Bed Opens to admit work of Large Diameters.

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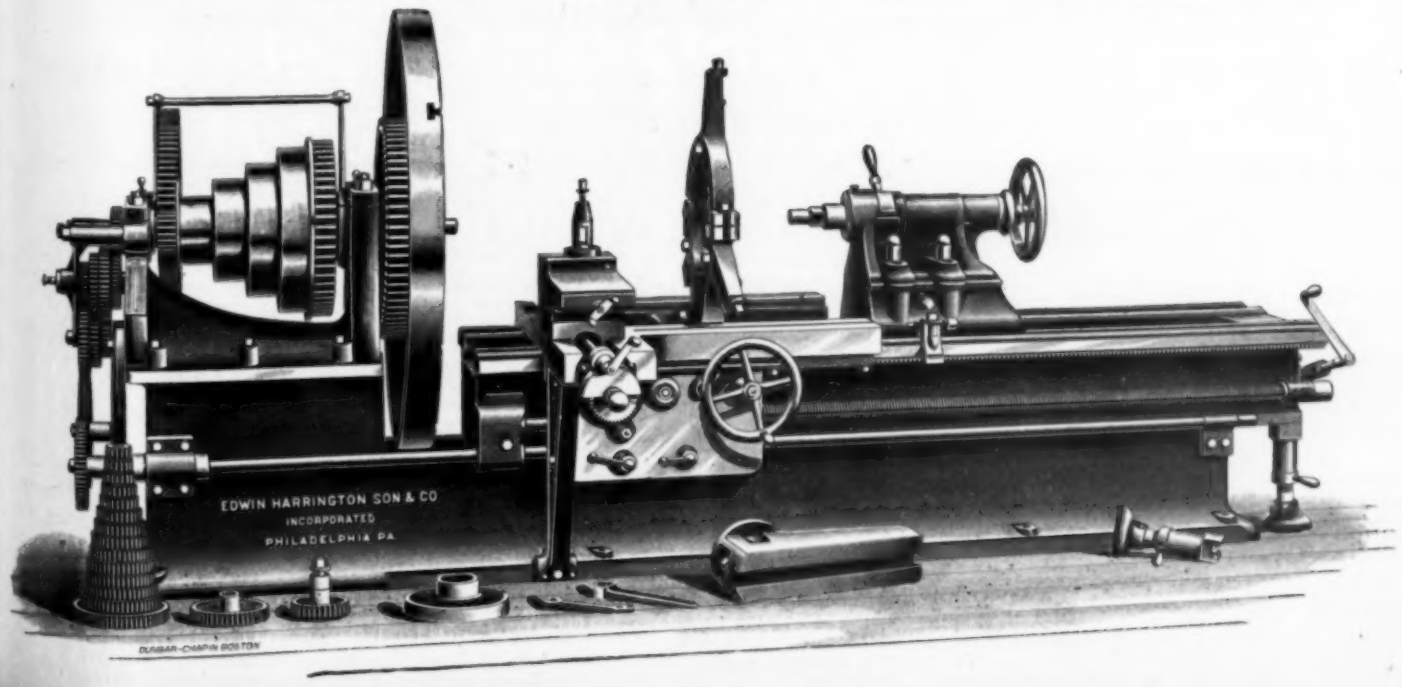

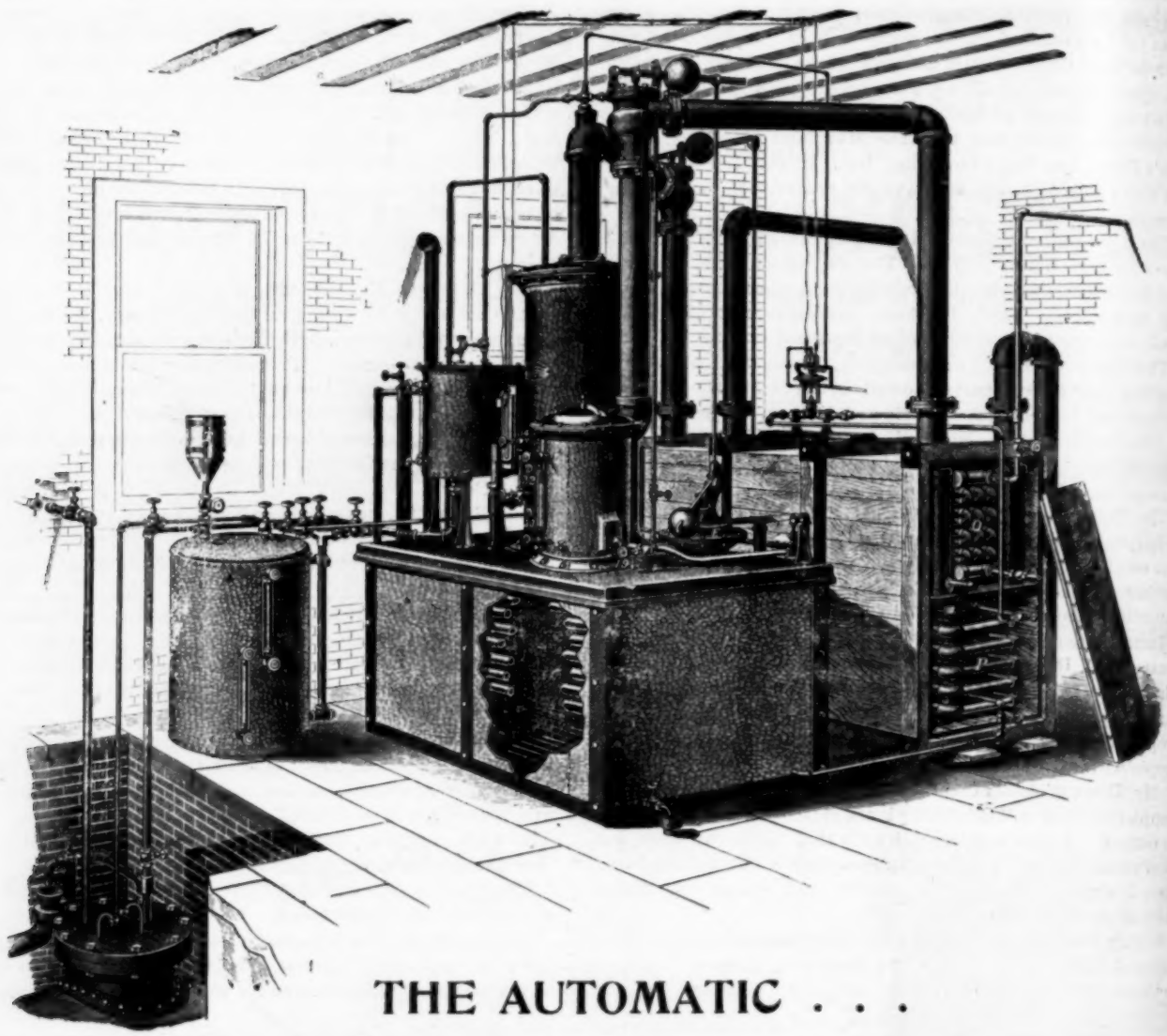

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The Putnam Nail Co., Boston, Mass.
The Pope Manufacturing Co., Hartford, Conn.
The Pope Tube Company, Hartford, Conn.
The Crescent Watch Case Company, Newark, N. J.
The Meriden Britannia Co.
The U. S. Mints and Assay Offices (everywhere).
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McGill University, Montreal.
Excelsior Needle Company, Torrington, Conn.
The National Sewing Machine Co., Belvidere, Ill.
The Elgin National Watch Co., Elgin, Ill.
The Sterling Cycle Works, Kenosha, Wis.
Charles S. Platt, Gold and Silver Refiners, N. Y. City.
The O'Hara Waltham Dial Co., Waltham, Mass.
The American Bank Note Company, New York.
The Bureau of Engraving and Printing, Washington.
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